NEW JERSEY HAZMAT EMERGENCY RESPONSE COURSE

HAZMAT TRAINING **COURSE NUMBER: 06013**

EMERGENCY MEDICAL SERVICES OPERATIONS —LEVEL II

PRESENTED BY:

NEW JERSEY STATE POLICE
OFFICE OF EMERGENCY MANAGEMENT
HAZARDOUS MATERIALS EMERGENCY RESPONSE PLANNING UNIT

2nd Edition

INSTRUCTIONS FOR FILLING OUT THE REGISTRATION FORM

- Begin on the side that has the words **REGISTRATION FORM** at the top.
- Use #2 pencil only.
- Your name will appear on your certificate exactly as you list it here.

FIRST NAME

1. In the open boxes under the area labeled FIRST NAME, start at the left and spell out your first name by printing letters in the boxes (1 letter per box).

—If you want to use a title in front of your name, start at the left and leave a blank box between the title and the first name. Due to limited space, abbreviations should be used as necessary.

e.g. Lieutenant Richard Tumid can be written as: Lt. Richard Tumid or Lieut. R. Tumid.

—If you don't use all the boxes leave the unfilled ones blank.

e.g. #1 There are eleven boxes available for your first name. If your name is Frank, fill in the first five boxes and leave the last six boxes blank.

e.g. #2 Mary Ellen spells her first name with a space between Mary and Ellen. She should leave a blank box between Mary and Ellen on the form. This would also leave the last space at the end blank.

M.I.

2. If you use a middle initial write it in the open box under M.I.

LAST NAME

3. In the open boxes under the area labeled LAST NAME, start at the left (the box immediately after the M.I. box) and spell out your last name by printing letters in the boxes leaving the extra boxes blank.

—After you have finished printing out your first name, middle initial and last name, go back and darken in the box under each letter that corresponds to that letter.

EXTENSION

4. Find the box labeled EXTENSION and if applicable darken the appropriate square.

HOME STREET ADDRESS

5. In the open boxes under the area labeled HOME STREET ADDRESS, start at the left and fill in your home STREET address only. **DO NOT INCLUDE THE NAME OF THE TOWN NOR YOUR ZIP CODE.** Leave spaces where you would normally leave them when writing it out.

e.g. 123 W. Main St. would use the first three blocks for the numbers 1, 2 & 3 followed by a space, then the letter W followed by a space, then the next four blocks for the letters in Main followed by a space and finally the next two blocks for St. or the next six for Street.

—Please leave the rest blank. Your CITY and STATE will be determined from your ZIP code.

APT. NO.

6. If applicable start at the left and fill in the open boxes under the area labeled APT. NO. If there is less than four letters and/or numbers leave spaces blank.

—After you have finished printing your home street address and if applicable Apt. No., go back and darken in the box under each letter or number that corresponds to that letter or number.

ZIP CODE

7. Find the area labeled ZIP CODE and fill in the open boxes with your **nine digit** ZIP code, if known. If you do not know your 9 digit zip code, then just enter the 5 digit number.

—When completed go back and darken in the box under each number that corresponds to that number.

DATE OF BIRTH

8. In the open boxes under the area labeled DATE OF BIRTH, fill in the month, day & year using two boxes for each. ALL the boxes must be filled out.

e.g. May 27, 1945 should be written as 05 27 45.

—When completed go back and darken in the box under each number that corresponds to that number.

SOCIAL SECURITY NO.

9. In the open boxes under the area labeled SOCIAL SECURITY NO. fill in your social security number.

—When completed go back and darken in the box under each number that corresponds to that number.

FOR BOXES 10, 11, 12 & 13 FILL IN ONLY ONE BUBBLE FOR EACH BOX

SEX

10. In the area labeled SEX, darken in the appropriate box.

ETHNIC GROUP

11. In the area labeled ETHNIC GROUP, darken in the appropriate box.

PRIMARY LANGUAGE

12. In the area labeled PRIMARY LANGUAGE, darken in the appropriate box.

EDUCATION LEVEL

13. In the area labeled EDUCATION LEVEL, darken in the appropriate box. All darken in the highest level of education in which you have completed.

HOME PHONE NUMBER

14. Turn over the form and begin with HOME PHONE NUMBER in the upper left hand corner.

—Fill in the open boxes with your area code and phone number, then go back and darken in the box under each number that corresponds to that number.

WORK PHONE NUMBER

15. Complete the WORK PHONE NUMBER the same as you did the HOME PHONE NUMBER.

COURSE START DATE

16. In the open boxes under the area labeled COURSE START DAY, list the month, day and year of the first day of this course. Every box must have a number entered into it.

—When completed go back and darken in the box under each number that corresponds to that number.

INSTRUCTORS NO.

17. All state certified instructors have an individual four digit number assigned to them. At each course, one instructor will be designated as the lead instructor. Place the lead instructor number in column #1.

—In the open boxes under the area labeled INSTRUCTORS NUMBERS, start on the left and list the number of the lead instructor first, then list the numbers of any additional instructions for this day's training.

—There is only enough room for the listing of three instructors.

—When completed go back and darken in the box under each number that corresponds to that number.

COURSE #

18. In the open boxes under the area labeled COURSE #, start on the left and write the course number that the lead instructor gives you.

—**NOTE:** All Course #s must be five digits. If you have a four digit # add a **0** to the **beginning** of the number.

e.g. Four digit #6007 should be written as five digit #06007.

—When completed go back and darken in the box under each number that corresponds to that number.

JURISDICTION SERVED M-CODES

19. In the open boxes under the area labeled JURISDICTION SERVED M-CODES, start on the left and write the code number that is assigned to the jurisdiction that you serve in your primary emergency service position. The lead instructor will have a list of the M-CODES for all municipalities in the state.

EMERG. SERVICE POSITION

20. The emergency service position that you receive pay from is your primary emergency service position. If you do not receive pay and have two or more volunteer positions then you must choose which one is your emergency service position. You can only choose ONE primary service position.

—In the area labeled EMERGENCY SERVICE POSITIONS, darken **one** "P" box next to your **primary** emergency service position. All other emergency service positions that you hold are secondary and you should darken the "S" box next to any that apply.

ANSWER FOR PRIMARY POSITION

21. The area labeled ANSWER FOR PRIMARY POSITION refers to your primary emergency service position and is divided into two sections.

—Darken in the appropriate box in the status section and the sector section.

QUESTIONS

22. Please answer the three questions as they apply to your emergency service positions.

NOTE: A baseline physical establishes a medical base that can be compared to future physical results to determine changes that may be caused by chemical exposure.

PRE-TEST

23. If your course uses a PRE-TEST follow the instructions of the lead instructor.

PLEASE INSURE THAT ALL AREAS ARE FILLED IN. ASK FOR HELP FROM YOUR INSTRUCTOR IF YOU ARE UNSURE OF HOW TO COMPLETE ANY AREA ON THE FORM.

REMEMBER, IF THIS FORM IS FILLED OUT INCORRECTLY, IT COULD RESULT IN YOU NOT RECEIVING A CERTIFICATE.

PLEASE USE #2 PENCIL ONLY.

Fill in name as you wish it to appear on your certificate.

REGISTRATION FORM

FIRST NAME | MI | LAST NAME

HOME STREET ADDRESS (Do not include city and state) | APT. NO.

EXTENSION

JR.
SR.
III

ZIP CODE

DATE OF BIRTH

SOCIAL SECURITY NO.

FOR EACH BOX CHOOSE ONE ONLY.

ETHNIC GROUP

- BLACK
- HISPANIC
- ASIAN
- CAUCASIAN
- OTHER

PRIMARY LANGUAGE

- ENGLISH
- SPANISH
- OTHER (specify)

EDUCATION LEVEL (Highest level only)

- SOME HIGH SCHOOL
- HIGH SCHOOL GRADUATE
- SOME COLLEGE / TECH. TRAINING
- COLLEGE TECH. SCHOOL DEGREE
- SOME GRADUATE STUDIES
- GRADUATE DEGREE

SEX

- MALE
- FEMALE

HOME PHONE NUMBER

COURSE START DATE

INSTRUCTORS NUMBERS

1 2 3

COURSE #

WORK PHONE NUMBER

Fill in ONLY ONE primary (P) and as many secondary positions (S) that apply

EMERGENCY SERVICE POSITIONS

1. Fire fighter
2. Police
3. Emergency medical service/BLS
4. Emergency medical service/ALS
5. Emergency room staff
6. Health officer
7. Hazmat team
8. Indust. fire brigade
9. Public works
10. Utility Authority
11. Emergency mgmt.
12. NJDEPE responder
13. Govt. official
14. Educator/trainer
15. Other public sector
16. Other private sector

ANSWER FOR PRIMARY POSITION

- Volunteer
- Paid Part-Time
- Paid Full-Time
- Public Sector
- Private Sector

Jurisdiction Served

M-CODES

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. - Have you ever been ill or injured due to hazardous substances?
2. - Are you enrolled in a medical surveillance program?
   (If yes) - Have you had a baseline exam?
   - Were the results explained to you?
   - Are you examined annually?
3. - Has any employer provided you with other health and safety training within the last two years?
   (If yes) - Did it cover your rights under Federal OSHA laws?
   - Did it cover your rights under State laws?

TEST VERSION

PRE-TEST ANSWERS

1–50 A B C D E

GEOGRAPHIC IDENTIFICATION CODE SCHEME

Incorporated Areas of New Jersey

Arranged Alphabetically by County and Municipality

All codes listed in this Manual will be four (4) digit codes

The first two (2) digits being the County Code, the second (2) being the Municipality Code

EXAMPLES:

Counties:

01—Atlantic County
02—Bergen County
03—Burlington County

Municipalities:

01—Absecon City
02—Atlantic City City
03—Brigantine City

Complete Code

0101—Atlantic County, Absecon City
0201—Bergen County, Allendale Borough
0301—Burlington County, Bass River Township

ATLANTIC COUNTY—01

0101 Absecon City
0102 Atlantic City
0103 Brigantine City
0104 Buena Borough
0105 Buena Vista Twsp.
0106 Corbin City
0107 Egg Harbor City
0108 Egg Harbor Twsp.
0109 Estell Manor City
0110 Folsom Borough
0111 Galloway Twsp.
0112 Hamilton Twsp.
0113 Hammonton Town
0114 Linwood City
0115 Longport Borough
0116 Margate City
0117 Mullica Twsp.
0118 Morthfield City
0119 Pleasantville City
0120 Port Republic City
0121 Somers Point City
0122 Ventnor City
0123 Weymouth Twsp.

BERGEN COUNTY—02

0201 Allendale Borough
0202 Alpine Borough
0203 Bergenfield Borough
0204 Bogota Borough
0205 Carlstadt Borough
0206 Cliffside Park Borough
0207 Closter Borough
0208 Cresskill Borough
0209 Demarest Borough
0210 Dumont Borough
0211 Elmwood Park Borough
0212 East Rutherford Borough
0213 Edgewater Borough
0214 Emerson Borough
0215 Englewood City
0216 Englewood Cliffs Borough
0217 Fair Lawn Borough
0218 Fairview Borough
0219 Fort Lee Borough
0220 Franklin Lakes Borough
0221 Garfield City
0222 Glen Rock Borough
0223 Hackensack City
0224 Harrington Park Borough
0225 Hasbrouck Heights Borough
0226 Haworth Borough
0227 Hillsdale Borough
0228 Hohokus Borough
0229 Leonia Borough
0230 Little Ferry Borough
0231 Lodi Borough
0232 Lyndhurst Twsp.
0233 Mahwah Twsp.
0234 Maywood Borough
0235 Midland Park Borough
0236 Montvale Borough
0237 Moonachie Borough
0238 New Milford Borough
0239 North Arlington Borough
0240 Northvale Borough
0241 Norwood Borough
0242 Oakland Borough
0243 Old Tappan Borough
0244 Oradell Borough
0245 Palisades Park Borough
0246 Paramus Borough
0247 Park Ridge Borough
0248 Ramsey Borough
0249 Ridgefield Borough
0250 Ridgefield Park Village
0251 Ridgewood Village
0252 River Edge Borough
0253 River Vale Twsp.
0254 Rochelle Park Twsp.
0255 Rockleigh Borough
0256 Rutherford Borough
0257 Saddle Brook Twsp.
0258 Saddle River Borough
0259 South Hackensack Twsp.
0260 Teaneck Twsp.
0261 Tenafly Borough
0262 Teterboro Borough
0263 Upper Saddle River Borough
0264 Waldwick Borough
0265 Wallington Borough
0266 Washington Twsp.
0267 Westwood Borough
0268 Woodcliff Lake Borough
0269 Wood-Ridge Borough
0270 Wyckoff Twsp.

BURLINGTON COUNTY—03

0301 Bass River Twsp.
0302 Beverly City
0303 Bordentown City
0304 Bordentown Twsp.

0305 Burlington City
0306 Burlington Twsp.
0307 Chesterfield Twsp.
0308 Cinnaminson Twsp.
0309 Delanco Twsp.
0310 Delran Twsp.
0311 Eastampton Twsp.
0312 Edgewater Park Twsp.
0313 Evesham Twsp.
0314 Fieldsboro Borough
0315 Florence Twsp.
0316 Hainesport Twsp.
0318 Lumberton Twsp.
0319 Mansfield Twsp.
0320 Maple Shade Twsp.
0321 Medford Twsp.
0322 Medford Lakes Borough
0323 Moorestown Twsp.
0324 Mount Holly Twsp.
0325 Mount Laurel Twsp.
0326 New Hanover Twsp.
0327 North Hanover Twsp.
0328 Palmyra Borough
0329 Pemberton Borough
0330 Pemberton Twsp.
0331 Riverside Twsp.
0332 Riverton Borough
0333 Shamong Twsp.
0334 Southampton Twsp.
0335 Springfield Twsp.
0336 Tabernacle Twsp.
0337 Washington Twsp.
0338 Westampton Twsp.
0317 Willingboro Twsp.
0339 Woodland Twsp.
0340 Wrightstown Borough

CAMDEN COUNTY—04

0401 Audubon Borough
0402 Audubon Park Borough
0403 Barrington Borough
0404 Bellmawr Borough
0405 Berlin Borough
0406 Berlin Twsp.
0407 Brooklawn Borough
0408 Camden City
0412 Cherry Hill Twsp.
0409 Chesilhurst Borough
0410 Clementon Borough
0411 Collingswood Borough
0413 Gibbsboro Borough
0414 Gloucester City
0415 Gloucester Twsp.
0416 Haddon Twsp.
0417 Haddonfield Borough
0418 Haddon Heights Borough
0419 Hi-Nella Borough
0420 Laurel Springs Borough
0421 Lawnside Borough
0422 Lindenwold Borough
0423 Magnolia Borough
0424 Merchantville Borough
0425 Mount Ephraim Borough
0426 Oaklyn Borough
0427 Pennsauken Twsp.
0428 Pine Hill Borough
0429 Pine Valley Borough
0430 Runnemede Borough
0431 Somerdale Borough
0432 Stratford Borough
0433 Tavistock Borough
0434 Voorhees Twsp.
0435 Waterford Twsp.
0436 Winslow Twsp.
0437 Wood-Lynne Borough

CAPE MAY COUNTY—05

0501 Avalon Borough
0502 Cape May City
0503 Cape May Point Borough
0504 Dennis Twsp.
0505 Lower Twsp.
0506 Middle Twsp.
0507 North Wildwood City
0508 Ocean City
0509 Sea Isle City
0510 Stone Harbor Borough
0511 Upper Twsp.
0512 West Cape May Borough
0513 West Wildwood Borough
0514 Wildwood City
0515 Wildwood Crest Borough
0516 Woodbine Borough

CUMBERLAND COUNTY—06

0601 Bridgeton City
0602 Commercial Twsp.
0603 Deerfield Twsp.
0604 Downe Twsp.
0605 Fairfield Twsp.
0606 Greenwich Twsp.
0607 Hopewell Twsp.
0608 Lawrence Twsp.
0609 Maurice River Twsp.
0610 Millville City
0611 Shiloh Borough
0612 Stow Creek Twsp.
0613 Upper Deerfield Twsp.
0614 Vineland City

ESSEX COUNTY—07

0701 Belleville Town
0702 Bloomfield Town
0703 Caldwell Borough
0705 Cedar Grove Twsp.
0706 East Orange City
0707 Essex Fells Borough
0704 Fairfield Borough
0708 Glen Ridge Borough
0709 Irvington Town
0710 Livingston Twsp.
0711 Maplewood Twsp.
0712 Millburn Twsp.
0713 Montclair Town
0714 Newark City
0715 North Caldwell Borough
0716 Nutley Town
0717 Orange City
0718 Roseland Borough
0719 South Orange Village
0720 Verona Borough
0721 West Caldwell Borough
0722 West Orange Town

GLOUCESTER COUNTY—08

0801 Clayton Borough
0802 Deptford Twsp.
0803 East Greenwich Twsp.
0804 Elk Twsp.
0805 Franklin Twsp.
0806 Glassboro Borough
0807 Greenwich Twsp.
0808 Harrison Twsp.
0809 Logan Twsp.
0810 Mantua Twsp.
0811 Monroe Twsp.
0812 National Park Borough
0813 Newfield Borough
0814 Paulsboro Borough
0815 Pitman Borough
0816 South Harrison Twsp.
0817 Swedesboro Borough
0818 Washington Twsp.
0819 Wenonah Borough
0820 West Deptford Twsp.
0821 Westville Borough
0822 Woodbury City
0823 Woodbury Heights Borough
0824 Woolwich Twsp.

HUDSON COUNTY—09

0901 Bayonne City
0902 East Newark Borough
0903 Guttenberg Town
0904 Harrison Town
0905 Hoboken City
0906 Jersey City City
0907 Kearny Town
0908 North Bergen Twsp.
0909 Secaucus Town
0910 Union City
0911 Weehawken Twsp.
0912 West New York Town

HUNTERDON COUNTY—10

1001 Alexandria Twsp.
1002 Bethlehem Twsp.
1003 Bloomsbury Borough
1004 Califon Borough
1005 Clinton Town
1006 Clinton Twsp.
1007 Delaware Twsp.
1008 East Amwell Twsp.
1009 Flemington Borough
1010 Franklin Twsp.
1011 Frenchtown Borough
1012 Glen Gardner Borough
1013 Hampton Borough
1014 High Bridge Borough
1015 Holland Twsp.
1016 Kingwood Twsp.
1017 Lambertville City
1018 Lebanon Borough
1019 Lebanon Twsp.
1020 Milford Borough
1021 Raritan Twsp.
1022 Readington Twsp.
1023 Stockton Borough
1024 Tewksbury Twsp.
1025 Union Twsp.
1026 West Amwell Twsp.

MERCER COUNTY—11

1101 East Windsor Twsp.
1102 Ewing Twsp.
1103 Hamilton Twsp.
1104 Hightstown Borough
1105 Hopewell Borough
1106 Hopewell Twsp.

1107 Lawrence Twsp.
1108 Pennington Borough
1109 Princeton Borough
1110 Princeton Twsp.
1111 Trenton City
1112 Washington Twsp.
1113 West Windsor Twsp.

MIDDLESEX COUNTY—12

1201 Carteret Borough
1202 Cranbury Twsp.
1203 Dunellen Borough
1204 East Brunswick Twsp.
1205 Edison Twsp.
1206 Helmetta Borough
1207 Highland Park Borough
1208 Jamesburg Borough
1210 Metuchen Borough
1211 Middlesex Borough
1212 Milltown Borough
1213 Monroe Twsp.
1214 New Brunswick City
1215 North Brunswick Twsp.
1209 Old Bridge Twsp.
1216 Perth Amboy City
1217 Piscataway Twsp.
1218 Plainsboro Twsp.
1219 Sayreville Borough
1220 South Amboy City
1221 South Brunswick Twsp.
1222 South Plainfield Borough
1223 South River Borough
1224 Spotswood Borough
1225 Woodbridge Twsp.

MONMOUTH COUNTY—13

1330 Aberdeen Twsp.
1301 Allenhurst Borough
1302 Allentown Borough
1303 Asbury Park City
1305 Atlantic Highlands Borough
1306 Avon-By-The-Sea Borough
1307 Belmar Borough
1308 Bradley Beach Borough
1309 Brielle Borough
1304 Colts Neck Twsp.
1310 Deal Borough
1311 Eatontown Borough
1312 Englishtown Borough
1313 Fair Haven Borough
1314 Farmingdale Borough
1315 Freehold Borough
1316 Freehold Twsp.
1339 Hazlet Twsp.
1317 Highlands Borough
1318 Holmdel Twsp.
1319 Howell Twsp.
1320 Interlaken Borough
1321 Keansburg Borough
1322 Keyport Borough
1323 Little Silver Borough
1324 Loch Arbour Village
1325 Long Branch City
1326 Manalapan Twsp.
1327 Manasquan Borough
1328 Marlboro Twsp.
1329 Matawan Borough
1331 Middletown Twsp.
1332 Millstone Twsp.
1303 Monmouth Beach Borough
1334 Neptune Twsp.
1335 Neptune City Borough
1337 Ocean Twsp.
1338 Oceanport Borough
1340 Red Bank Borough
1341 Roosevelt Borough
1342 Rumson Borough
1343 Sea Bright Borough
1344 Sea Girt Borough
1345 Shewsbury Borough
1346 Shewsbury Twsp.
1347 South Belmar Borough
1348 Spring Lake Borough
1349 Spring Lake Heights Borough
1336 Tinton Falls Borough
1350 Union Beach Borough
1351 Upper Freehold Twsp.
1352 Wall Twsp.
1353 West Long Branch Borough

MORRIS COUNTY—14

1401 Boonton Town
1402 Boonton Twsp.
1403 Butler Borough
1404 Chatham Borough
1405 Chatham Twsp.
1406 Chester Borough
1407 Chester Twsp.
1408 Denville Twsp.
1409 Dover Town
1410 East Hanover Twsp.
1411 Florham Park Borough
1412 Hanover Twsp.
1413 Harding Twsp.
1414 Jefferson Twsp.
1415 Kinnelon Borough
1416 Lincoln Park Borough
1417 Madison Borough
1418 Mendham Borough
1419 Mendham Twsp.
1420 Mine Hill Twsp.
1421 Montville Twsp.
1422 Morris Twsp.
1423 Morris Plains Borough
1424 Morristown Town
1425 Mountain Lakes Borough
1426 Mount Arlington Borough
1427 Mount Olive Twsp.
1428 Netcong Borough
1429 Parsippany-Troy Hills Twsp.
1430 Long Hill Twsp.
1431 Pequannock Twsp.
1432 Randolph Twsp.
1433 Riverdale Borough
1434 Rockaway Borough
1435 Rockaway Twsp.
1436 Roxbury Twsp.
1437 Victory Gardens Borough
1438 Washington Twsp.
1439 Wharton Borough

OCEAN COUNTY—15

1501 Barnegat Light Borough
1533 Barnegat Twsp.
1502 Bay Head Borough
1503 Beach Haven Borough
1504 Beachwood Borough
1505 Berkeley Twsp.
1506 Brick Twsp.
1507 Dover Twsp.
1508 Eagleswood Twsp.
1509 Harvey Cedars Borough
1510 Island Heights Borough
1511 Jackson Twsp.
1512 Lacey Twsp.
1513 Lakehurst Borough
1514 Lakewood Twsp.
1515 Lavallette Borough
1516 Little Egg Harbor Twsp.
1517 Long Beach Twsp.
1518 Manchester Twsp.
1519 Mantoloking Borough
1520 Ocean Twsp.
1521 Ocean Gate Borough
1522 Pine Beach Borough
1523 Plumsted Twsp.
1524 Point Pleasant Borough
1525 Point Pleasant Beach Borough
1526 Seaside Heights Borough
1527 Seaside Park Borough
1528 Ship Bottom Borough
1529 South Toms River Borough
1530 Stafford Twsp.
1531 Surf City Borough
1532 Tuckerton Borough

PASSAIC COUNTY—16

1601 Bloomingdale Borough
1602 Clifton City
1603 Haledon Borough
1604 Hawthorne Borough
1605 Little Falls Twsp.
1606 North Haledon Borough
1607 Passaic City
1608 Paterson City
1609 Pompton Lakes Borough
1610 Prospect Park Borough
1611 Ringwood Borough
1612 Totowa Borough
1613 Wanaque Borough
1614 Wayne Twsp.
1615 West Milford Twsp.
1616 West Paterson Borough

SALEM COUNTY—17

1701 Alloway Twsp.
1713 Carney's Point Twsp.
1702 Elmer Borough
1703 Elsinboro Twsp.
1704 Lower Alloways Creek Twsp.
1705 Pennsville Twsp.
1706 Mannington Twsp.
1707 Oldmans Twsp.
1708 Penns Grove Borough
1709 Pilesgrove Twsp.
1710 Pittsgrove Twsp.
1711 Quinton Twsp.
1712 Salem City
1714 Upper Pittsgrove Twsp.
1715 Woodstown Borough

SOMERSET COUNTY—18

1801 Bedminster Twsp.
1802 Bernards Twsp.
1803 Bernardsville Borough
1804 Bound Brook Borough
1805 Branchburg Twsp.
1806 Bridgewater Twsp.
1807 Far Hills Borough
1808 Franklin Twsp.

1809 Green Brook Twsp.
1810 Hillsborough Twsp.
1811 Manville Borough
1812 Millstone Borough
1813 Montgomery Twsp.
1814 North Plainfield Borough
1815 Peapack-Gladstone Borough
1816 Raritan Borough
1817 Rocky Hill Borough
1818 Somerville Borough
1819 South Bound Brook Borough
1820 Warren Twsp.
1821 Watchung Borough

SUSSEX COUNTY—19

1901 Andover Borough
1902 Andover Twsp.
1903 Branchville Borough
1904 Byram Twsp.
1905 Frankford Twsp.
1906 Franklin Borough
1907 Fredon Twsp.
1908 Green Twsp.
1909 Hamburg Borough
1910 Hampton Twsp.
1911 Hardyston Twsp.
1912 Hopatcong Borough
1913 Lafayette Twsp.
1914 Montague Twsp.
1915 Newton Town
1916 Ogdensburg Borough
1917 Sandyston Twsp.
1918 Sparta Twsp.
1919 Stanhope Borough
1920 Stillwater Twsp.
1921 Sussex Borough
1922 Vernon Twsp.
1923 Walpack Twsp.
1924 Wantage Twsp.

UNION COUNTY—20

2001 Berkeley Heights Twsp.
2002 Clark Twsp.
2003 Cranford Twsp.
2004 Elizabeth City
2005 Fanwood Borough
2006 Garwood Borough
2007 Hillside Twsp.
2008 Kenilworth Borough
2009 Linden City
2010 Mountainside Borough
2011 New Providence Borough
2012 Plainfield City
2013 Rahway City
2014 Roselle Borough
2015 Roselle Park Borough
2016 Scotch Plains Twsp.
2017 Springfield Twsp.
2018 Summit City
2019 Union Twsp.
2020 Westfield Town
2021 Winfield Twsp.

WARREN COUNTY—21

2101 Allamuchy Twsp.
2102 Alpha Borough
2103 Belvidere Town
2104 Blairstown Twsp.
2105 Franklin Twsp.
2106 Frelinghuysen Twsp.
2107 Greenwich Twsp.
2108 Hackettstown Town
2109 Hardwick Twsp.
2110 Harmony Twsp.
2111 Hope Twsp.
2112 Independence Twsp.
2113 Knowlton Twsp.
2114 Liberty Twsp.
2115 Lopatcong Twsp.
2116 Mansfield Twsp.
2117 Oxford Twsp.
2118 Pahaquarry Twsp.
2119 Phillipsburg Town
2120 Pohatcong Twsp.
2121 Washington Borough
2122 Washington Twsp.
2123 White Twsp.

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ACKNOWLEDGEMENTS

The New Jersey State Police, Office of Emergency Management, appreciates the efforts of the following individuals and agencies in the development and preparation of this course:

Keith McCabe, MICP, University EMS; Special Operations Division, Newark, NJ

Jeff Steinman, EMT, University EMS; Special Operations Division, Newark, NJ

Union-Middlesex Hazardous Materials Advisory Council

New Jersey State First Aid Council

PREFACE

This course is designed for emergency medical personnel who have previously taken the New Jersey Hazardous Materials Level 1 Awareness Course. Successful completion of this course earns the participant eight (8) hours of operational level hazardous materials instruction which meets the OSHA 29 CFR 1910.120 requirements and PEOSH requirements NJAC 12:100-17.1. This course has also been approved for CEU's by the N.J. Dept. of Health, Office of Emergency Medical Services.

HAZARDOUS MATERIALS EMERGENCY RESPONSE PLANNING UNIT

Robert Lanard	Lieutenant, Bureau Chief Training and Program Support Bureau New Jersey State Police
Bob Hansson	Principal Planner Hazardous Materials Emergency Response Planning Unit New Jersey State Police
Bill McDonald	Sergeant FC Hazardous Materials Emergency Response Planning Unit New Jersey State Police
Mike Augustyniak	Supervising Planner Hazardous Materials Emergency Response Planning Unit New Jersey State Police
Glenn Bukowski	Principal Training Technician Human Resource Development Institute Department of Personnel
Lance Oram	Sergeant Hazardous Materials Emergency Response Planning Unit New Jersey State Police

COURSE: EMERGENCY MEDICAL SERVICES HAZARDOUS MATERIALS OPERATIONS

PURPOSE:

To provide training for emergency medical personnel responding to a hazardous materials incident without compromising the health and safety of the patient or the rescuer.

GOALS:

The participant will:

- develop an understanding of the role and responsibilities of the emergency medical provider at a hazardous materials incident.
- develop the knowledge, skills and ability to safely and effectively prepare for and respond to a hazardous materials incident.

Table of Contents

MODULE 1 FOUNDATION 11

Section 1. PRE-PLANNING 13

Section 2. IDENTIFICATION 20

Section 3. CHEMICAL TERMS 35

Section 4. SITE SET-UP 49

Section 5. PERSONAL PROTECTIVE EQUIPMENT 53

MODULE 2 INCIDENT ASSESSMENT AND STRATEGIC PLANNING 67

Section 1. NOTIFICATION AND RESPONSE 68

Section 2. ROLES AND RESPONSIBILITIES 75

Section 3. BASIC HAZARD AND RISK ASSESSMENT TECHNIQUES 83

Section 4. INFORMATION MANAGEMENT 103

MODULE 3 MEDICAL OPERATIONS AND TACTICS 107

Section 1. MEDICAL MONITORING 109

Section 2. OVEREXPOSURE AND/OR INJURY 127

Section 3. DECONTAMINATION 133

Section 4. PATIENT CARE 145

Section 5. TRANSPORT 147

Section 6. REHABILITATION 157

Section 7. POST INCIDENT 176

MODULE 4 EXERCISES 181

MODULE 5 COURSE REVIEW 189

MODULE 6 REFERENCES 194

MODULE 7 GLOSSARY 196

DEFINITIONS

HAZARDOUS MATERIALS

Any substance or material in a quantity or form which poses an unreasonable risk to health, safety and property when transported in commerce.

U.S. Department of Transportation

HAZARDOUS SUBSTANCE

Any substance designated under the Clean Water Act and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) as posing a threat to waterways and the environment when released.

Environmental Protection Agency

HAZARDOUS WASTE

Hazardous Waste means any waste or combination of wastes which pose a substantial present or potential hazard to human health or living organisms because such wastes are nondegradable or persistent in nature, or because they can biologically magnify or because they can be lethal, or because they may otherwise cause or tend to cause detrimental cumulative effects.

Code of Federal Regulations
Title 40. Part 261
Environmental Protection Agency

DANGEROUS GOODS

Canada

HAZARDOUS CHEMICAL

Any chemical which presents a physical hazard or a health hazard to employees.

OSHA

EXTREMELY HAZARDOUS SUBSTANCE

Chemical determined by the E.P.A. to be extremely hazardous to a community during an emergency spill or release as a result of its toxicity and physical/chemical properties.

EPA

HAZARDOUS MATERIAL (SUBSTANCE/WASTE)

Any substance that causes or may cause adverse affects on the health or safety of employees, the general public, or the environment; any biological agent and other disease-causing agent, or a waste or combination of wastes.

NFPA 472

INCIDENT

The release or potential release of a hazardous material into the environment.

NFPA 472

INCIDENT COMMANDER

The local person responsible for all decisions relating to the management of the incident. The Incident Commander is in charge at the incident site.

NFPA 472

"TEST YOUR HAZ-MAT IQ"

1. Hazardous materials victims with skin exposure injuries are decontaminated with flowing water for at least fifteen (15) minutes with their clothes, shoes, rings, and jewelry still on to save time.

   True _____ False _____

2. Name two (chemical substances that can produce DELAYED serious toxic symptoms and effects.

   a. _____

   b. _____

3. All contaminated personal possessions should be plastic bagged and marked for quarantine, decontamination, or disposal.

   True _____ False _____

4. Contaminated clothes can be worn after they are dried and aired thoroughly.

   True _____ False _____

5. Toxic or irritating fumes can be transmitted through air conditioning or central heating ducts in a hospital.

   True _____ False _____

6. All hospital laboratories can perform tests on victims that will confirm the amount of hazardous materials absorbed from an incident.

   True _____ False _____

7. Most EMS response equipment can be protected from contamination by 3 mil or 4 mil trash bags or plastic sheeting.

   True _____ False _____

8. Heavy water-resistant leather boots serve as well as rubber boots in a hazardous materials environment.

   True _____ False _____

9. Soft contact lenses which cover the surface of the eye are superior to glasses in a hazardous materials environment.

   True _____ False _____

10. About half of the victims at hazardous materials incidents are emergency responders.

    True _____ False _____

Module 1

FOUNDATION

Module 1

FOUNDATION

Objectives:

Upon completion of this course the student will be able to:

1. PRE-PLANNING

- Name 2 reasons to have pre-incident response plans.
- Name and explain 2 parts of an Emergency Response Plan.
- Name 3 agencies which have standards or laws specifying training and/or planning requirements for hazardous materials incidents.
- List 5 pieces of equipment needed for a hazmat response.
- Name and explain three types of pre-incident records.

2. IDENTIFICATION

- List 6 clues for detecting the presence of hazardous materials.
- List 9 classifications of hazardous materials as designated by the UN/NA system.
- Explain the NFPA 704 marking system.

3. CHEMICAL TERMS

- Define the following properties of materials: density, specific gravity, vapor density, vapor pressure, pH, LEL/UEL, flashpoint, water solubility, IDL.H, TLV-TWA, TLV-STEL.
- Provide a basic definition of radioactivity.
- Provide a basic definition of "half-life" of a substance.
- Name 3 types of radioactive exposure and the appropriate protection for each.
- List 3 characteristics of a "confined space".

4. SITE SET-UP

- Name and explain the 3 exposure control areas at a HazMat scene.

5. PERSONAL PROTECTIVE EQUIPMENT

- Name and explain the 4 levels of PPE.
- Name and explain 3 ways that PPE is compromised.

Equipment requirements

- Personnel protective equipment
- Testing and monitoring equipment
- Apparatus
- Items for special purposes such as dike material for oil spills, neutralizing chemicals for acid and base spills, etc.
- Communication equipment—access to data bases, CHEMTREC, and government agencies.
- Transportation for evacuations, movement of injured personnel (ambulances, etc.)

Part of the response plan must include the involvement with the community. Many incidents have a high visibility and local citizens will express a greater concern for a hazardous material incident than they would for a fire. Generally the public views a fire with curiosity and as a spectator item. Clouds of gas or vapors threaten them and emergency responders can expect calls from concerned citizens. A part of the response plan must allocate resources to the community. In some areas it might simply involve a communication link with the local emergency planning committee and in others the Haz Mat operation may require community evacuation, etc.

In resolving a hazardous materials incident, there are many resources (both people and equipment) that will have to be brought together to effectively and safely mitigate the incident. Imagine trying to locate a bulldozer or large amounts of absorbent material on a weekend night. How do you contact CHEMTREC? Who is in charge at a haz-mat incident? Who has the authority to order an evacuation? All of these questions and many more must be answered long before a haz-mat incident occurs.

Besides being the common sense way to effectively and safely handle haz-mat incidents, planning is also a legal requirement. OSHA, RCRA, the Toxic Catastrophe Prevention Act, and SARA all require planning by either the private employer and/or public agencies. By law, state, county, and local governments are required to have basic emergency management plans that will cover many possible disasters. As an annex to the disaster planning process SARA requires the development of a plan that specifically addresses hazardous materials. This hazardous materials contingency plan should be the basis for the response of all expected emergency responders to a haz-mat incident.

These plans should have been developed by a planning committee that included representation from many different agencies as well as the public and are as site specific as possible to take into account local conditions. The process of preparing for a haz-mat incident does not end with the development of the plan. In order for any plan to work it must be known to the people expected to use it and they must have practiced with it. Even the best appearing plan will not be effective if the responders have not tried it out to see if it is realistic. As part of the process of being an emergency responder, you must know the local plan, your role in it, and what is expected of you. Just as this hazardous materials technician course will help prepare you to respond to haz-mat incidents, so will the local emergency response plan.

Hazardous Materials Annex (Emergency Response Plan)

A hazardous materials annex should contain the following information:

- Identity of hazards within the jurisdiction.
- Assumption of what would happen if an incident occurred at one of the hazardous materials locations.
- A policy statement that identifies the expected operations and defines roles and authority, as well as notification of other agencies.
- Phases of emergency management including mitigation, preparedness, response, and recovery.
- Direction and control including alerting of the public, emergency operations center (EOC) activation, and cleanup oversite.
- Organization and assignment with responsibilities assigned to specific department heads.
- Administration and logistics for support of the operations envisioned in the contingency plan.
- Appendices that provide for mutual aid, emergency response reference guides, telephone numbers of people, industries, and agencies that might be called upon for assistance. These appendices should also include contractor response procedures (this is where you get your bulldozer), evacuation and traffic routing information, and any other needed information that supports the haz-mat plan.

Planning

Know what major businesses and industries in your community use, store or transport hazardous materials. If possible, meet with them to discuss their emergency plan in case of an accident.

- Contacts, including names and phone numbers
- Do plants have internal hazardous materials teams?
- Location of decontamination showers in the plants

Know who is available to provide a HAZMAT Emergency Response Team to your community, and an alternate if they are not available. If possible, meet with them to discuss how you can best work together at an emergency in your community.

Provide means for having the necessary equipment available for personal protection of the EMS workers—consider disposable items to minimize the need for decontamination.

The items in your vehicle must accommodate incidents involving a variety of hazardous materials. The following list is a starting point which your unit should refine and alter to suit the conditions of your most common incidents.

VEHICLE EQUIPMENT CHECKLIST

- Binoculars to assess scene from a safe distance.
- Plastic sheeting and clear trash bags (3 or 4 mil) to protect equipment and dispose of contaminated articles (i.e. freezer bags, labels, indelible markers).
- Disposable blankets (plastic coated) and disposable clear transport bags to contain liquids on the patient.
- Inexpensive stethoscopes, blood pressure cuffs and other gear which can be discarded if contaminated.
- Appropriate personal protective equipment.
- Skin-covering outer wear (long sleeve shirts, coveralls, disposable gowns, etc.).
- A generous supply of fresh water to flush away contaminants (more than you normally carry).
- A large supply of oxygen to treat breathing problems caused by exposure to hazardous materials (more than you normally carry).
- Isotonic saline for eye exposure (more than you would normally carry).
- Common food oil for removal of chemical tars.
- A disposable Bag-Valve-Mask (BVM) or similar device in lieu of mouth-to-mouth. (Pocket masks are NOT acceptable.)
- Disposable gowns and slippers for patients who must remove contaminated clothes at the scene.
- Copy of the current "D.O.T. Emergency Response Guidebook."
- One or more of the following treatment guides:
  a. Bronstein & Currance's "Emergency Care for Hazardous Materials Exposure"
  b. Deichmann & Gerard's "Toxicology of Drugs & Chemicals"
  c. Dreisbach's "The Handbook of Poisoning"
  d. Patty's Volume 2, "A-B-C."
  e. Stutz & Janusz "Hazardous Materials Injuries"
- The contact number for the regional poison control center and a list of physicians or other knowledgeable contacts specializing in treating exposure to hazardous materials. (See page 133.)
- The CHEMTREC 24-hour response number (1-800-424-9300). CHEMTREC also provides medical information.

- A list of area hospitals *BEST PREPARED* to accept and treat victims contaminated by hazardous materials.
- Saran Wrap.

OTHER EQUIPMENT NEEDS

_____

_____

_____

_____

_____

NOTE: Consider storing hazardous materials support gear in a portable locker or single area of the vehicle. This will make it easier to quickly locate this specialized gear.

***DO NOT** wear or carry ANY leather apparel (including shoes), soft contact lenses or other personal articles which absorb chemical contaminants. Wallets, badge cases, leather belts, jewelry, etc. should be left in plastic bags and stored in a safe location. If these are accidentally contaminated, they may have to be disposed of (without recovery of contents, e.g. wallets).*

Communications

Establish or review communication procedures for information collection and dissemination, as well as for operations. Will the necessary information be collected (see First Call Prompting Form or CHEMTREC form for model)?

Establish or review communication procedures for operations. Do the emergency service organizations in your community follow an Incident Command System (ICS)?

Maintain a list of radio frequencies used by local fire, police, EMS and Hazardous Materials units. Is there a common frequency that you are capable of using?

An EMS officer should respond to the Command Post, or minimally a second portable radio should be provided to the Incident Commander or Command Post.

Provide First Call Prompting Forms in your unit's vehicles to record information transmitted about a hazardous materials incident.

Communications should be in plain language. They should be simple and concise. All communications should be acknowledged. Communications should be directed to the Incident Commander unless an Emergency Medical Branch has been established. Responding units should use their town name to be identified correctly, rather than their radio identification number.

PRE-INCIDENT RECORD KEEPING PROCEDURE

Training records

Medical records

- exposure records

Maintenance records

- calibration records

Pre-incident information from the New Jersey Right to Know Act.

Incident record keeping begins long before the actual incident. Records are kept on both the individuals and equipment which will respond to an incident. This includes training records for all courses and drills attended by members.

Medical records should be maintained and exposures that may occur should be documented. Annual SCBA face piece fit test records are required to be maintained as per OSHA 1910.134.

Records should be kept for equipment as well, to show maintenance and inspection of each piece. Monitoring equipment needs to be collected on a routine basis and recorded.

Module 1

FOUNDATION

Objectives:

Upon completion of this course the student will be able to:

2. Incident Assessment and Planning

A.

- Name 8 pieces of information on the first call prompting form.
- Name 8 elements of the preliminary and progress reports given to the dispatch center.
- Name and explain 4 roles of EMS at a HazMat incident with patients.

B.

- List 3 goals of the EMS provider.
- List and explain the five sessions of the ICS.
- List 3 responsibilities of the EMS safety officer.

C.

- Explain the DECIDE process.
- Name three reference sources for hazardous materials information.
- Demonstrate the use of 3 references for hazardous materials information.
- List 4 factors which affect the behavior of hazardous materials.
- Explain the difference between offensive and defensive actions.
- List and explain 3 types of onsite records which should be generated and maintained for a HazMat incident.

Section 2

IDENTIFICATION

Six Clues for Detecting the Presence of Hazardous Materials

OCCUPANCY AND/OR LOCATION

PRODUCTION FACILITY

Any and all industrial process and production facilities are likely sites for hazardous materials, because of the frequent use of these chemicals in production processes. Production site storage is an area of special concern.

STORAGE

Target areas where hazardous materials are stored before and after they are transported to the general geographic area of use. Examples of these locations are:

- LP gas tanks and tank farms
- hospitals (bulk oxygen storage, etc.)
- local chemical distributors
- agricultural chemical dealers
- hardware stores
- petroleum tank farms
- power generation facilities

When a hazardous materials incident occurs, the first step in determining the hazards and risks associated with the release is to identify the material present. That means making as positive and as accurate an identification as possible. To do this you need the specific name of the material involved. In attempting to identify the material involved you should keep in mind three points:

- You must ask for the information you need. Do not wait for outsiders to contact you. You realize the need for the information long before anyone else does. You need to know where to get the needed information.

- You must get some information yourself before you can use other sources for more information. You will need to make an accurate identification before you can unlock other sources for additional information.

- When you get more information, you have to know how to use it defensively. Remember the information may confuse you if you do not know how to use it. Events analysis can help you figure out how to put that information to work as fast as you get it. To use events analysis you need to look for information that helps you estimate the likely harm without intervention.

TRANSPORTATION

Hazardous materials are moved in great quantity and via all five modes of transportation throughout the country. Of special note as locations where one is likely to encounter hazardous materials are:

- railroad lines
- cargo loading and unloading facilities
- general motor trucking
- delivery areas
- truck terminals
- airport terminals and fuel storage facilities
- river transport vessels/seaport facilities
- pipelines

A haz-mat incident involving transportation will present problems based on the quantity and types of materials involved, the modes of transportation used (road, water, rail, pipeline, or air), the route, time of day, frequency of shipment, the hazards associated with the material, and the vulnerability of the container to damage.

Among the sources you can use for identification of hazardous materials in a transportation incident are: container shape, shipping papers, markings and colors, DOT placards, and package labels.

CONTAINER SHAPE

Just as the U.S. Department of Transportation establishes definitions for classes of hazardous materials, they also regulate the types of containers in which the material may be transported. The regulations set forth performance specifications that the container requirements apply on all quantities of hazardous material, from a small bottle to a 30,000 gallon tank car; the required types of containers are listed in the Code of Federal Regulations, alongside each hazardous material. Specification containers must likewise have certain certificaton data printed/stamped on them. This, coupled with the physical characteristics of some materials, can provide us with fairly accurate information on the presence of hazardous materials.

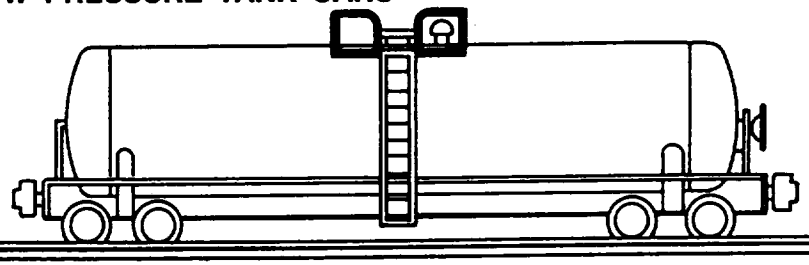
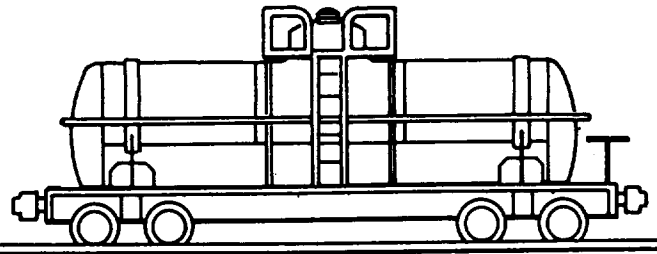
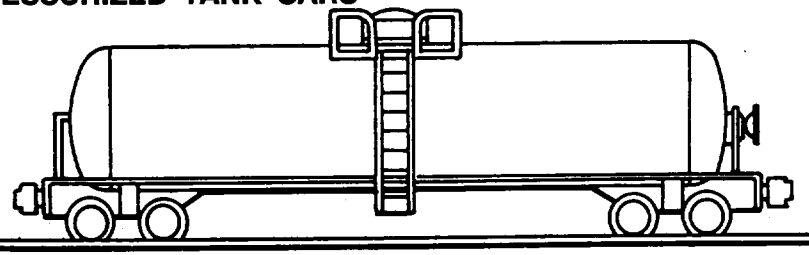
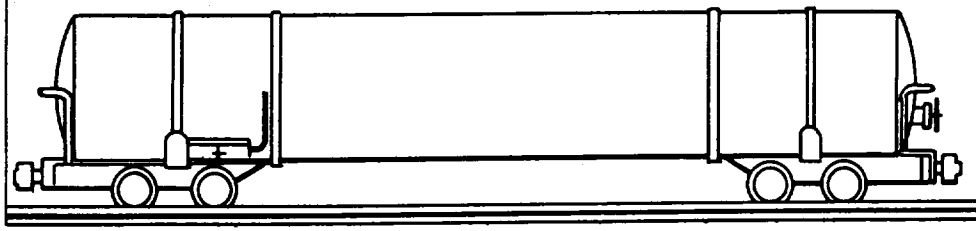
The discussion necessary to cover the different types of specification containers is extremely detailed and lengthy. In the following pages, a few of the most obvious features of container shape and configuration will be presented. The student is referred to other texts for additional information.

TANK CARS AND TRUCKS

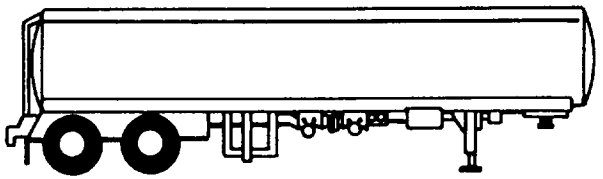
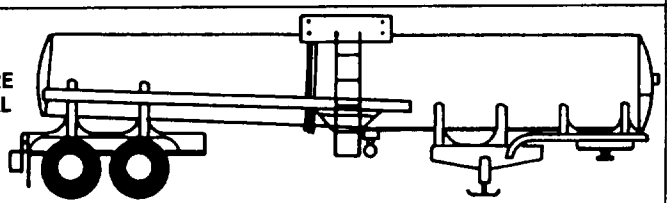
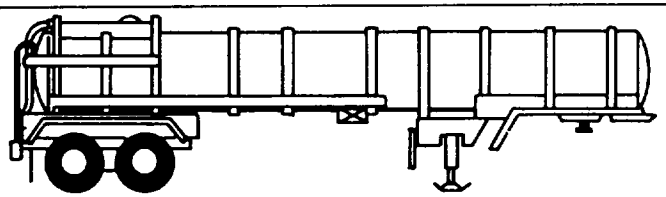
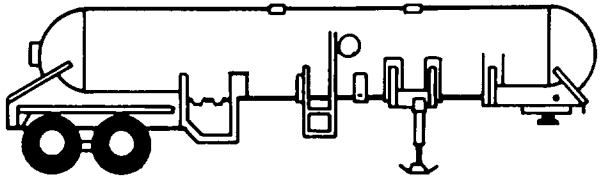
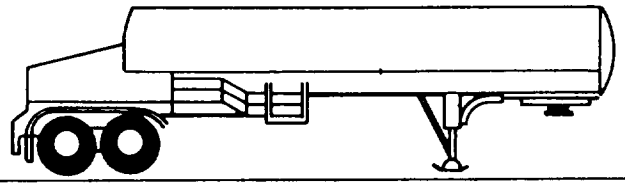
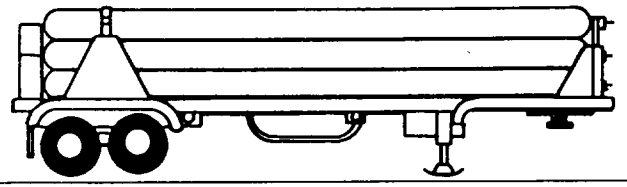
In the case of many tank cars, examination of the ends can indicate the presence of a pressurized gas. Due to the inherent strength of this construction, these vessels generally have hemispherical ends. In contrast, a low pressure vessel is not required to have this great mechanical strength; it will generally have flattened ends.

However, it should be noted that due to the increasing use of highly insulated and double wall construction, the tank structure that we can see may be merely the outside jacket; not the true containment vessel.

RAILROAD TANK CARS

CONTAINER SHAPE	DESCRIPTION	CONTENTS
LOW PRESSURE TANK CARS  	• HORIZONTAL TANK WITH FLAT, OR NEARLY FLAT ENDS. • FITTINGS AND VALVING VISIBLE ON TOP OF CAR. • OLDER CARS WILL HAVE AN EXPANSION DOME WITH VISIBLE FITTINGS. • TANK PRESSURES LESS THAN 100 psi. • OFTEN HAS BOTTOM UNLOADING VALVES.	• TRANSPORTS WIDE VARIETY OF LIQUIDS, MOLTEN SOLIDS AND SOME LIQUEFIED GASES.
PRESSURIZED TANK CARS 	• HORIZONTAL TANK WITH ROUNDED ENDS. • FITTINGS AND VALVES ENCLOSED IN DOME. • OFF-WHITE PAINT INDICATES SPRAYED-ON THERMAL INSTULATION. • BLACK PAINT USUALLY WILL INDICATE A JACKETED TANK CAR.	• TRANSPORTS FLAMMABLE AND NON-FLAMMABLE COMPRESSED GASES AND CLASS A POISONS.
CRYOGENIC LIQUID TANK CARS 	• WELL-INSULATED "THERMOS BOTTLE" DESIGN. • DOUBLE SHELL TANK SIMILAR TO FIXED STORAGE TANKS. • TRANSPORT LOW-PRESSURE REFRIGERATED LIQUIDS (PRESSURES 25psig OR LOWER). • ABSENCE OF ANY TOP FITTINGS. • LOADING/UNLOADING FITTINGS AND SAFETY RELIEF DEVICE OFTEN FOUND IN CABINETS AT DIAGONAL CORNERS OR ON ONE END AT GROUND LEVEL.	• TRANSPORTS LIQUID OXYGEN, LIQUID HYDROGEN, LIQUID NITROGEN.

CARGO TANK TRUCKS

CONTAINER SHAPE	DESCRIPTION	CONTENTS
MC-306 ATMOSPHERIC PRESSURE CARGO TANK TRUCKS 	• OVAL CROSS SECTION INDICATES NON-PRESSURIZED TANK (LESS THAN 3 psi) • USUALLY SINGLE-SHELL, ALUMINUM CONSTRUCTION. OLDER STEEL CONSTRUCTED TANKS MAY BE FOUND. • GENERALLY 9,000 GALLONS MAXIMUM CAPACITY.	• TRANSPORTS PETROLEUM PRODUCTS (GASOLINE, FUEL OIL), CLASS B POISIONS.
MC-307 LOW-PRESSURE CHEMICAL CARGO TANK TRUCKS 	• CIRCULAR CROSS SECTION WITH PRESSURES UP TO 25 psi. • DOUBLE SHELL CONSTRUCTION WITH INSULATION THE MOST COMMON. • INSULATED TANKS MAY NOT APPEAR CIRCULAR IN CROSS SECTION. • ONE OR TWO COMPARTMENTS WITH OVERTURN PROTECTION. • GENERALLY 6,000 TO 7,000 GALLONS MAXIMUM CAPACITY.	• TRANSPORTS FLAMMABLE AND COMBUSTIBLE LIQUIDS, MILD CORROSIVES, MOST CHEMICALS, ETC.
MC-312 CORROSIVE CARGO TANK TRUCKS 	• CIRCULAR CROSS SECTION, SMALLER DIAMETER WITH EXTERNAL REINFORCING RIBS OFTEN VISIBLE. • MAY ALSO BE FOUND IN DOUBLE SHELL CONFIGURATION. • INSULATED TANKS MAY NOT APPEAR CIRCULAR IN CROSS SECTION. • OVERTURN AND SPLASH PROTECTION AT DOME COVER/VALVE LOCATIONS. • GENERALLY 5,000 TO 6,000 MAXIMUM CAPACITY.	• TRANSPORTS STRONG CORROSIVES.
MC-331 HIGH PRESSURE GAS CARGO TANK TRUCKS 	• CIRCULAR CROSS SECTION WITH ROUNDED ENDS OR HEADS. • SINGLE SHELL, NON-INSULATED TANK. • UPPER TWO-THIRDS PAINTED WHITE OR HIGHLY REFLECTIVE COLOR. • CAPACITY RANGES FROM 2,500 ("BOBTAIL" DELIVERY TRUCK) TO 11,500 GALLONS (CARGO TANK TRUCK).	• TRANSPORTS LP GASES AND ANHYDROUS AMMONIA (PARTICULARLY IN THE SPRING).
MC-338 CRYOGENIC LIQUID TANK TRUCKS 	• WELL-INSULATED "THERMOS BOTTLE" DESIGN WITH FLAT TANK ENDS. • DOUBLE SHELL TANK WITH RELIEF PROTECTION. • OFTEN HAVE VAPORS DISCHARGING NORMALLY FROM RELIEF VALVES.	• TRANSPORT CRYOGENIC LIQUIDS (E.G. LOX, LIQUID NITROGEN, LIQUID ARGON AND LIQUID CARBON DIOXIDE).
COMPRESSED GAS TRAILER 	• OFTEN REFERRED TO AS A "TUBE TRAILER". • CYLINDERS ARE STACKED AND MANIFOLDED TOGETHER. • MANIFOLD AT REAR. • PRESSURES RANGE FROM 3,000 TO 5,000 psi. • OFTEN FOUND AT CONSTRUCTION AND INDUSTRIAL SITES.	• TRANSPORTS COMPRESSED GASES (E.G. OXYGEN, NITROGEN, HYDROGEN).

As a further complication, some tank cars have multiple compartments, which can contain different materials with varying types and degrees of hazards.

On **rail tank cars,** the presence of a protective manway housing on top of the car indicates a pressurized gas; the protective housing contains the valves, appliances for loading and unloading product, and relief devices. The presence of valving on the bottom of the car usually indicates a liquid bearing car.

On **cargo tank trucks,** in contrast, many pressure vessels have their valving on the bottom and relief valves on the top. This can create problems during a roll over.

It should be apparent that there are a great number of rules, exceptions to rules, and exceptions to exceptions in this area, and at best it is complicated and confusing.

Without appearing to be overly cautious, any accident involving a transport vehicle, should be approached with the attitude that it is carrying hazardous materials. Tank cars, box cars, van trailers, gondolas, and bulk cargo carriers are of special concern.

There are a number of marking systems in use to indicate the possible presence of hazardous materials. Some are generally used in transportation, others primarily used at fixed facilities. We will discuss the more widely used systems. It is incumbent upon us to use aids to vision, such as binoculars, to be able to obtain this information at the greatest possible distance.

MARKINGS AND COLORS

Names may be stenciled on tanks, vats, or other containers of hazardous materials or the facility may use the NFPA 704 marking systems. The NFPA 704 system was originally designed to be placed on the outside of a building or tank to warn firefighters of the hazards within a building, the system has now been adapted to include container labels and a variation of the 704 system, the Hazardous Materials Identification System (HMIS), has been designed exclusively for container labels.

The 704 system uses a four colored diamond (blue for health, red for flammability, yellow for reactivity, and white for special information) which contains one of the five numbers (0-4) to indicate the degree of hazard for health, flammability, and reactivity. Zero represents no hazard and a four represents a severe and immediate hazard. The numbers between 0 and 4 represent an increasing degree of reactivity. The white area of the marking systems are reserved for special information such as water reactive, radioactive, etc. The NFPA system does not provide for the specific identity of the material itself, HMIS does provide a space for the chemical or common name of the material.

The New Jersey Right to Know Law provides that certain fixed facilities must label all containers within the facility and send a chemical inventory of hazardous materials to the local police and fire departments. This chemical inventory is known as the Community Right to Know Survey and while it might be useful at a haz mat incident, it is much more useful for pre-planning purposes.

SARA Title III provides for emergency planning and notification of the local fire department as to the identity of hazardous material kept on a site that is covered by the law. As part of the notification of the fire department, industry must send Material Safety Data Sheets (MSDS) and a chemical inventory to the fire department.

Regardless of the means that you use to identify the hazardous material involved in the incident, it is critical that you spell the name of the material correctly. Most of the information resources you use list materials alphabetically and misspelling by even a single letter could be disastrous.

- Ethanol is a clear, colorless liquid with an aromatic aroma. It has a flashpoint of 55°F (CAS #64-17-5)
- Ethanal is a clear colorless liquid with a pungent choking odor and has a flashpoint of –36°F (CAS #75-07-0)
- The vapors of ethanal are irritating to the eyes and mucous membranes and it may polymerize spontaneously, additionally it forms unstable oxides in air.
- Pure Ethanol is found in liquor.

LABELS AND PLACARDS

Both government and industry have acknowledged that the most vital information immediately needed to properly handle a hazardous materials incident is some method of quickly identifying what material is involved. To achieve this, an identification system has been implemented which is affixed to containers of hazardous material.

The "label" is attached to individual drums, cyliners, boxes, bags and packages of hazardous materials.

The "placard" is a 10¼-inch point-on-point diamond which is displayed on four sides of large shipping containers, rail cars, trucks and other vehicles used to transport hazardous materials.

Labels and placards were created to be simple in design yet still present needed information. The following information may be found on either a label or a placard:

- a color
- a symbol
- a number, and
- one or two words.

Independently, each of them can give the observer or emergency responder a reasonable clue to what the basic hazards are of the material involved.

A word of caution. The absence of a placard from a vehicle or rail car does not mean that there is no hazardous material aboard. DOT regulations do not require placards on highway shipments of less than 1,001 pounds of some hazardous materials and 999 pounds of some of these commodities can cause a great deal of damage.

Furthermore, it must be acknowledged that there are numerous cases where regulated shipments were not labeled or placarded. Regardless of why the material is unlabeled or placarded, these omissions are illegal. While in many cases the placement of the appropriate placards was just forgotten or overlooked, investigators say that truckers have removed placards completely or posted placards indicating lesser hazards so the vehicles can use routes and tunnels where hazardous materials are prohibited.

Markings and labels you are likely to encounter in the field:

NJRTK "Universal Labeling":

Every container at a site should be labeled with the five major ingredients (with CAS #) of the material in the container plus any additional hazardous substances:

NAME:	CAS #:
Hydroquinone	123-31-9
Paraformaldehyde	30525-89-4
Sodium Methanal Bisulfate	870-72-4
Triethylene Glycol	112-27-6
Water	7732-18-5
Sodium Sulfite	7757-83-7

Any container with more than 1% of its contents unknown must include in its label "Contents Unknown" or "Contents Partially Unknown" in addition to other required labeling.

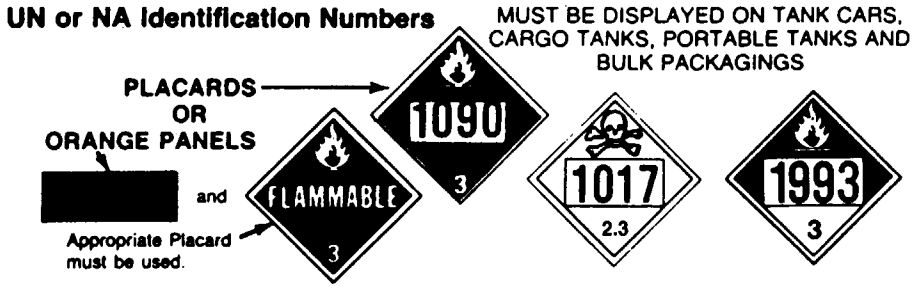
NAME:	CAS #:
Hydroquinone	123-31-9
Paraformaldehyde	30525-89-4
CONTENTS PARTIALLY UNKNOWN	

All pipelines must be labeled (name and CAS #) near valves, outlets, drains, and junctions with the contents.

Process vessels will have a placard or other label posted nearby with the chemical names and CAS # of their contents.

Small containers (2 ounces or less) will have code labels that are explained on in-house charts or books.

DOT Placards and Labels:



Pipelines at a site may be color-coded to give you a general idea of their contents:

YELLOW pipes carry hazardous materials such as a toxic, flammable, corrosive, etc. chemicals.

BLUE pipes carry low pressure gases at near ambient temperatures. The materials pose little threat to life or property.

GREEN pipes carry liquids that pose little or no threat to life or property (non-flammable, non-toxic, etc.).

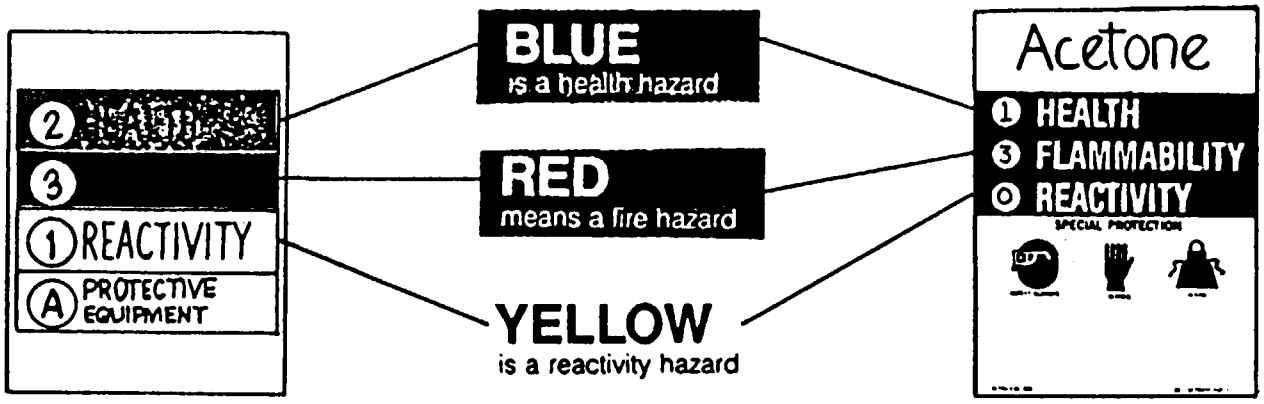
RED pipes carry fire quenching materials (water, halon, foam, carbon dioxide, etc.).

HMIS and NFPA labels:

Colors specify the type of hazard:
- RED—Fire Hazard
- YELLOW—Reactivity Hazard
- BLUE—Health Hazard
- WHITE—Special Information

Numbers specify the degree of hazard:
- 0 = Minimal Hazard
- 1 = Slight Hazard
- 2 = Moderate Hazard
- 3 = Serious Hazard
- 4 = Severe Hazard

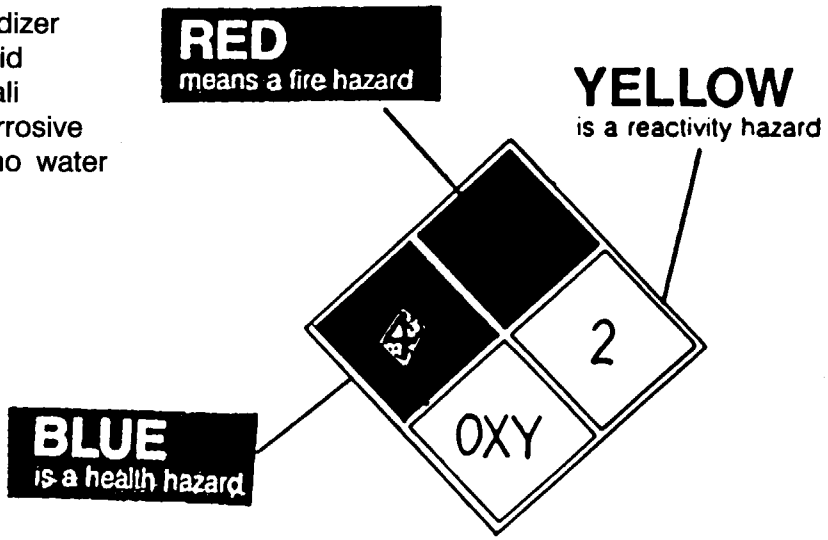
On HMIS (Hazardous Material Information System) labels, the upper white bar identifies the material in the container. The lower white bar identifies personal protective equipment required.



On NFPA (National Fire Protection Association) labels, the lower diamond (white) identifies specific hazards:

OXY = oxidizer
ACID = acid
ALK = alkali
COR = corrosive
W = use no water

= radioactive



Spanish Language signs and labels:

Chalked warnings:

They are **NOT** legally accepted labels but if you find one, you had best **stop and think** about what it means.

There is one placard that is used that has caused problems for emergency responders in the past. It is the word "dangerous" on a red and white background. It could indicate a shipment of several different classes of certain hazardous materials in one vehicle with a total weight over 1,001 lbs.

PLACARD COLOR	EXPLANATION
ORANGE	It goes boom!
GREEN	It's a lie.
RED	It burns.
CANDY STRIPE	Never take candy from a stranger.
YELLOW	See orange.
WHITE	It will kill you.
BLACK & YELLOW	It's not your job.
BLACK & WHITE	Remember the rule of 9's—chemical burns are nine times as bad as thermal burns.
DANGEROUS	You'd better believe it.

Special Thanks to Chris Waters, National Fire Academy.

SHIPPING PAPERS

The best information that emergency personnel can get at a hazardous materials incident may come from the shipping papers, which accompany the cargo regardless of which mode of

transportation is involved. These papers can tell exactly how much of each material is on board, the type of packaging, the hazard class, the proper shipping name, the U.N. number, the destination and who shipped it.

SHIPPING DOCUMENTS

Any shipment of materials, whether hazardous or not, must be accompanied by sufficient documentation to prove that the transport of the material is legal; that is, not stolen.

Hazardous materials have additional requirements for documentation to assist emergency response personnel in gaining information about the shipment. All of the following types of shipping papers will have at least the following information:

- Proper shipping name.
- Primary hazard classification.
- Number of packages.
- 4 digit hazardous ID number.
- Correct weight.
- A 24 hour emergency response telephone number.

Emergency response information must accompany the shipping papers. As a minimum, the emergency response information must contain:

- The description of the hazard material.
- Immediate hazards to health.
- Risk of fire or explosion.
- Immediate precaution to be taken in the event of an accident or incident.
- Immediate methods for handling small or large fires.
- Initial methods for handling spills or leaks in the absence of fire.
- Preliminary first aid measures.

The information can be presented in a shipping paper or in a document, other than a shipping paper, i.e., ERG, MSDS.

There are some differences among the documents used in each mode of transport. Each mode's shipping papers will be discussed.

RAIL TRANSPORTATION

- A "freight waybill" specifies the contents of a specific car of a train.
- A "train consist" lists all of the cars in a train by its identifying number and contents.
- The waybill, consist, and other related information is the responsibility of the conductor, although it may be held by any train crew member.
- The rail industry uses a 7-digit code number for each commodity it transports. It is known as the STCC (Standard Transportation Commodity Code) and is found on all rail documents.

  **Hazardous Material STCC numbers always begin with 49. That is to say, if the STCC number's first two digits are 49, the commodity is a hazardous material.

HIGHWAY TRANSPORTATION

- The "Bill of Lading" is the primary highway shipping document. It specifies each commodity being transported.
- The Bill of Lading is the responsibility of the truck's driver, and it should be within his reach while driving. If the driver leaves the vehicle unattended, the documents are supposed to be left on the driver's seat or in a pouch on the driver's side door.

AIR TRANSPORTATION

- The "Airbill" is the shipping document associated with air transport.
- The Airbill is the responsibility of the aircraft's pilot, and should be retained in a suitcase in the cockpit.

WATER TRANSPORTATION

- The Dangerous Cargo Manifest specifies the quantity and types of commodities being transported by the vessel.
- The DCM is the responsibility of the Master of the vessel and will be found in the wheel house, along with other information about its location.
- On barges, manifests are placed in mailbox-type containers.

FIXED FACILITIES, INCLUDING STORAGE FACILITIES

Unlike transportation incidents where the identity of the material can be anything depending on the vehicle involved, fixed facilities generally have hazards that are common to that facility. Fixed facilities can be more thoroughly planned for and the identification of the material might be known upon receipt of the alarm. However, just because you know the facility involved does not mean that you automatically know the identity of the material involved. You still must identify the material. To do that you can use markings and colors, labels and inventory lists generated in compliance with the New Jersey Right to Know Law and SARA Title III, and pre-emergency planning.

USE OF THE SENSES TO DETECT THE PRESENCE OF HAZARDOUS MATERIALS

If you smell a strange odor, if you feel a strange sensation on your skin or even if you get a strange taste in your mouth, you are probably in the wrong place and should use those signs as an indication to leave.

The sense of smell is also extremely dangerous as a means of detection, as many deadly poisonous materials have little or no odor associated with their vapor. In others, the threshold (concentration of vapor in air) required to be identified is far over the level where injury will occur. It is unfortunate that many references state 'pungent' or other reference to odor in their description of the physical properties of hazardous materials. This might lead untrained and unsuspecting individuals to use odors as a primary method of detection.

In any case, do not use the sense of smell as a method of hazardous materials detection. It is an extremely dangerous practice.

The sense of hearing may be of value in detecting the escape of gas from a relief valve, or a (hopefully distant) explosion. It is generally of limited use.

The effective use of one's vision, especially when aided by binoculars and telescopes, may provide the best indication of hazardous materials presence.

Classes of Hazardous Materials

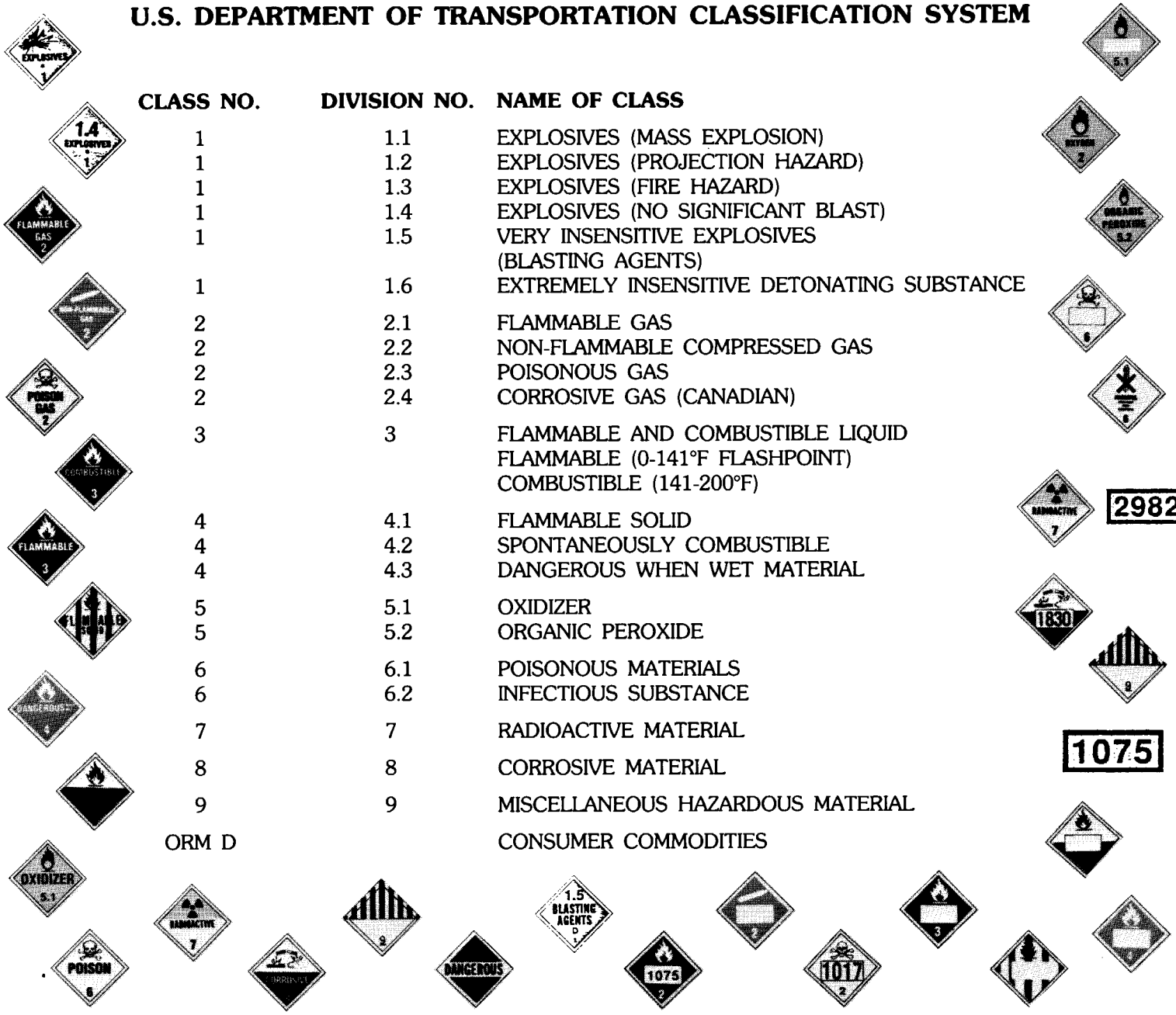
UN CLASSIFICATION SYSTEM

The United Nations (UN) classification system is an international system used to break materials into nine hazard classes based on their primary hazard. The UN system's nine basic classes are:

Class 1 —Explosives.
Class 2 —Gases.
Class 3 —Flammable liquids.
Class 4 —Flammable solids; spontaneously combustible materials; and materials that are dangerous when wet.
Class 5 —Oxidizers and organic peroxides.
Class 6 —Poisonous and etiologic (infectious) materials.
Class 7 —Radioactive Materials.
Class 8 —Corrosives.
Class 9 —Miscellaneous Hazardous Materials.

U.S. DEPARTMENT OF TRANSPORTATION CLASSIFICATION SYSTEM

CLASS NO.	DIVISION NO.	NAME OF CLASS
1	1.1	EXPLOSIVES (MASS EXPLOSION)
1	1.2	EXPLOSIVES (PROJECTION HAZARD)
1	1.3	EXPLOSIVES (FIRE HAZARD)
1	1.4	EXPLOSIVES (NO SIGNIFICANT BLAST)
1	1.5	VERY INSENSITIVE EXPLOSIVES (BLASTING AGENTS)
1	1.6	EXTREMELY INSENSITIVE DETONATING SUBSTANCE
2	2.1	FLAMMABLE GAS
2	2.2	NON-FLAMMABLE COMPRESSED GAS
2	2.3	POISONOUS GAS
2	2.4	CORROSIVE GAS (CANADIAN)
3	3	FLAMMABLE AND COMBUSTIBLE LIQUID FLAMMABLE (0-141°F FLASHPOINT) COMBUSTIBLE (141-200°F)
4	4.1	FLAMMABLE SOLID
4	4.2	SPONTANEOUSLY COMBUSTIBLE
4	4.3	DANGEROUS WHEN WET MATERIAL
5	5.1	OXIDIZER
5	5.2	ORGANIC PEROXIDE
6	6.1	POISONOUS MATERIALS
6	6.2	INFECTIOUS SUBSTANCE
7	7	RADIOACTIVE MATERIAL
8	8	CORROSIVE MATERIAL
9	9	MISCELLANEOUS HAZARDOUS MATERIAL
ORM D		CONSUMER COMMODITIES



Module 1

FOUNDATION

Objectives:

Upon completion of this course the student will be able to:

3. Medical Operations and Tactics

A.

- Explain procedures for onsite medical monitoring of the HazMat entry team.

B.

- Name 4 ways to be exposed to hazmat.
- List 3 factors which control exposure and dose of a hazardous material.
- List 4 routes of entry of HazMat into the body.
- List 10 common signs and symptoms of over exposure.

C.

- Define definitive and gross decontamination.
- Explain basic decontamination procedures for most incidents.

D.

- Explain patient triage consideration at a HazMat scene.
- Explain the S.T.A.R.T. system of triage.
- Explain patient treatment procedures at a HazMat scene.

E.

- List at least 5 pieces of information which must be relayed to the ED.
- List 2 procedures which would reduce exposure potential to the EMS responder.
- List 2 reasons why Aeromedical transport is not routinely used at HazMat incidents.

F.

- List 2 reasons to have rehab services at the HazMat incident.
- List the three responsibilities of the Rehab group.
- List 3 standards of a rehabilitation site.

G.

- List 3 post event considerations for the EMS responder.

Section 3

CHEMICAL TERMS

HAZARDOUS SUBSTANCES:

Functional Classification:

Effectively; hazardous materials will either blow you up, burn you, asphyxiate you, infect you, irradiate you, poison you, or freeze you.

Explosives are materials like nitrates used in the manufacture of fertilizers, TNT, or blasting caps. They are all materials that undergo a very rapid chemical transformation. This rapid reaction produces a dangerous shock wave. The terms high or low explosive do not indicate the severity of the hazard you face. These terms only indicate the speed of the flame front in the material.

- High or detonating explosives have detonation rates as high as four miles per second. They can be sub-divided into primary and secondary high explosives.
- Primary high explosives may be detonated by shock, heat, or friction. Examples are lead azide and mercury fulminate.
- Secondary high explosives usually require a booster for detonation and are relatively insensitive to shock, heat, and friction. Examples are TNT and dynamite.
- Low or deflagrating explosives have slower detonation rates; 1000 feet per second or less. Example is smokeless powder (for firearms).

Flammable substances include organic solvents, finely divided metals and powders, some classes of fibers, textiles, or plastics, and chemicals that evolve or absorb oxygen during storage (oxidizers) and constitute a fire hazard.

Materials in which dangerous heat buildup occurs during storage. The heat buildup occurs as a result of either oxidation or microbial action. Examples are fish meal, wet waste papers, and other organic waste material.

Oxidizers (such as hydrogen peroxide) are a subclass of flammable substances. They release oxygen and produce heat on contact with organic substances thus constituting a fire hazard. Organic peroxides are a combination of oxidizer and organic substance; they may burst into flame upon exposure to air or light.

Asphyxiants are materials that deprive body tissue of oxygen. Their action can be simple or chemical. Simple asphyxiants act by displacing oxygen in the air that you breathe causing oxygen starvation. This can cause headache, unconsciousness, and eventual death. Chemical asphyxiants cause death by affecting your body's ability to use the oxygen in the air you breathe. Some, like carbon monoxide prevent the transport of oxygen in the bloodstream by binding strongly with hemoglobin. Other materials act by preventing the transfer of oxygen from the bloodstream to body tissues; like hydrogen cyanide.

Toxic (poisonous) substances are drugs, chemicals, and natural or synthetic products that are in any way harmful to life or health. The effects range from skin irritations through death. Some terms that you should be familiar with when discussing toxic materials are:

Toxicity—This is a measure of how harmful a material is. Toxicity is usually measured by the LD_{50} or LC_{50} (the amount of material required to kill half a population of lab animals) of a substance.

Carcinogens are those substances that cause cancer.

Mutagens are materials that cause genetic changes in the cells of you gonads (sperm or eggs) that can be passed on to any children you have after the exposure. Mutations can also be precursors of cancer.

Teratogens are substances that cause damage to a developing fetus (unborn child) but do not affect any future pregnancies.

Biological hazards or etiologic agents are living germs and viruses (or the toxins they produce) that can cause human disease. You are aware that you might encounter etiologic agents when dealing with incidents that involve hospital wastes but remember the dog that lives on the site of a hazardous materials incident is also a biological hazard.

Radioactive substances are materials that emit ionizing radiation.

Corrosive substances can be either acids or bases (caustics). They are materials that burn or otherwise damage body tissue, metals, plastics or other materials as a result of contact. Examples are sodium hydroxide (lye) and sulfuric acid. The **acidity** or **basicity** of a substance is measured by **pH.** The **pH scale** runs from 0 to 14; 7 is neutral (neither acidic or basic); numbers less than 7 are acidic; and numbers higher than 7 are basic. (See table on page 18.)

Cryogenic substances are extremely cold materials like liquid oxygen or nitrogen. They have temperatures below –200 degrees Celsius. There is no separate UN Class number for cryogenics, however most of them are found in Class 2 and Class 5.

pH OF SOME COMMON SUBSTANCES

	14	
lye		
	13	
household ammonia	12	
	11	**BASIC**
lime water		
	10	
borax		
	9	
baking soda		
	8	
blood		
milk	7	**NEUTRAL**
rain	6	
black coffee	5	
tomatoes	4	
soda		
	3	**ACIDIC**
lemon juice	2	
gastric fluid	1	
	0	

PHYSICAL PROPERTIES OF HAZARDOUS SUBSTANCES:

Density—is the mass per unit volume of a substance. It is usually expressed as grams per cubic centimeter (g/cc). The density of water is 1 g/cc since 1 cc of water has a mass of 1 g.

Specific gravity—The ratio of the density of a solid or liquid to the density of water. This number tells you whether the material floats or sinks in water. A number greater than 1 indicates that the substance sinks; numbers less than 1 indicate that the substance floats. Knowing if the substance sinks or floats in water will determine your containment strategy; use booms on floating materials in a body of water and dike sinking materials.

Vapor density (VD)—The relative density of a vapor compared to air. A vapor with a VD of less than 1 is "lighter than air" and will rise. Vapors with densities greater than 1 will drop and collect in low-lying areas and pockets. Again, whether a material sinks or rises will affect your incident control strategy.

Vapor pressure—A measure of how readily a solid or liquid mixes with air at its surface. Higher VPs (approaching 760mm Hg) indicate a volatile substance and suggests that there will be high concentrations in the air at an incident involving that substance. Vapor pressures above 760mm Hg indicate a material that is normally a gas. Vapor pressure generally increases as a substance is heated.

Boiling point (BP)—The temperature at which the vapor pressure of the material being heated equals atmospheric pressure. Attaining the boiling point is just a specific case of dealing with vapor pressure.

Flammable (explosive) limits—The highest and lowest concentrations of a substance that can explode or burn. The upper explosive limit **(UEL)** is the richest mixture of a substance that can explode (any richer and there is not enough oxygen) while the lower explosive limit **(LEL)** is the most lean (any leaner and there is not enough of the substance). The LEL is measured with a Combustible Gas Indicator **(CGI)**. Generally, an area must be evacuated if the CGI reads 10% of the LEL.

Flash point (FP)—The lowest temperature at which the vapor given off by a substance forms an ignitable mixture with air. This is only a flash, not a self-sustained fire. As a general rule of thumb, the lower the FP the more volatile the substance.

Ignition temperature—(Also called AUTOIGNITION TEMPERATURE). The minimum temperature required to initiate self-sustained combustion of a material or compound.

Water solubility—The degree to which a material or its vapors dissolve in water. Materials that readily dissolve are described as "miscible". The solubility of a substance will affect your situation control strategy; if a substance is miscible in water, all the runoff water from a hazardous materials incident site may have to be diked and retained for decontamination or proper disposal. Many Petrochemicals **do not** dissolve in water. The EMS must be aware of this characteristic when decontaminating.

RADIOACTIVITY:

Radioactivity is the spontaneous disintegration of unstable atomic nuclei accompanied by the emission of ionizing radiation. Ionizing radiation can be either particles or pure energy.

There are two general types of radioactive substances: those with induced radioactivity and naturally occurring radioactive substances. In either case, the atoms of the substance emit particles and energy to attain a stable state.

$$^{12}_{6}C + {}^{1}_{1}H \longrightarrow {}^{13}_{7}N$$

$$^{13}_{7}N \longrightarrow {}^{0}_{1}e + {}^{13}_{6}C$$

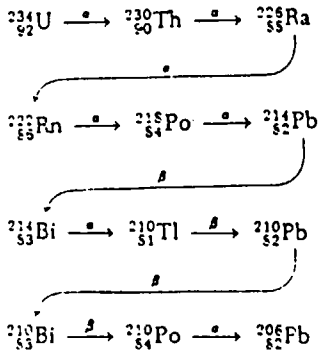
A nuclear equation, like a chemical equation, shows to the left of the arrow the substances that react to yield the products shown to the right.

Induced radioactivity occurs when a normally stable atom is bombarded by other particles. If there is enough energy in the incoming particles, they will combine with the bombarded atom's nucleus to form a new, heavier nucleus. If the new nucleus has an unstable ratio of protons and neutrons, it will undergo **radioactive decay.** For example, if carbon atoms are bombarded with protons, a proton is absorbed by the carbon atom nucleus. This addition changes the atom to an unstable nitrogen isotope. (**Isotopes** are forms of an element with different numbers of neutrons or electrons but the usual number of protons for that element.) The nucleus is unstable with too many protons and too much positive electrical charge. To attain stability, the atom emits some of this excess positive charge in the form of a positron. This, in effect, changes one of the protons into a neutron (neutral charge) and restores stability to the atom. The carbon atom is now a slightly different form of carbon (an isotope: Carbon 13) but stable.

The **rate of radioactive decay** is usually expressed as the half-life ($t_{1/2}$) of the nucleus. Half-life is the time required for half of a given amount of a radioactive substance to decay. For the nitrogen isotope that we just considered, the half-life is 10.1 minutes. This means that for any group of these nitrogen isotopes, half will have decayed at the end of 10.1 minutes; half of the remainder will decay during the 10.1 minutes after that; and so-on.

"Natural radioactivity" refers to the decay of naturally occurring unstable atoms. If we accept the geologists' estimate of the age of the earth as 5 billion years, we can see that naturally occurring radioactive isotopes must have long half-lives or they would all be gone by now. Uranium, in fact, has a half-life of 4.5 billion years, so, approximately half of the uranium that existed when the earth was formed is decayed. As uranium decays, it changes into other elements, like thorium, with a half-life of 24.1 days. As you can see, if the thorium supply were not being constantly replenished by the decay of uranium, there would soon be no thorium left. As uranium decays, it goes through a "decay series" in which it decays into radioactive (unstable) forms of: thorium, radium, radon, polonium, lead, bismuth, telurium, lead (again), bismuth (again), polonium (again), and, after emitting enough radiation, the original uranium decays into stable lead.

With $^{234}_{92}U$, many steps are required, involving a combination of α and β decays, as in the following:

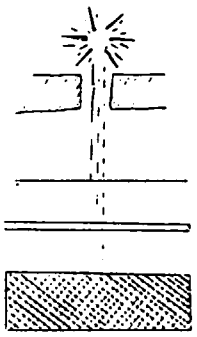


PARTICLES, RAYS, ROENTGENS, RADS, AND REMS

Radioactive exposure usually comes in the form of exposure to particles or rays from a **radioactive source.** Particles and rays are, generally, emitted in three forms during radioactive decay: **alpha and beta particles,** or **gamma rays.**

Alpha particles are, essentially, helium nuclei (two protons and two neutrons) that have been stripped of their electrons. They are massive and travel only three or four inches from a radioactive source. Very little shielding is required to stop alpha particles; several sheets of paper are enough. Sources of alpha radiation can adhere to dust particles and be inhaled which causes lung exposure and possible cancer risks.

Beta particles are more energetic and less massive than alpha particles. They can be either electrons, carrying a negative electrical charge, or positrons, carrying a positive charge. Beta particles can travel up to one hundred feet from their source and can penetrate firefighters' turnout gear. They can be stopped by one millimeter of aluminum.



Gamma rays or **photons** are not particles but are a form of pure energy. They are like X-rays and can travel great distances from their source. Gamma rays can only be stopped by massive shielding; three inches of lead. We measure the amount of these particles and rays in terms of roentgens, rads, and rems.

A **roentgen** is a measure of production. It is the amount of radiation produced by a specific size electrical discharge in a unit of dry air. Nearly all of the instruments that you encounter at an incident will be calibrated in roentgens.

A **REM** (**R**oentgen **E**quivalent **M**an) is a measure of the amount of radiation you have received. The REM is a unit of measure that is of more concern to the health physicist. Specifically, it is the receipt of one roentgen of x-rays (or the equivalent) by living tissue. Usually the REM is too large a unit to conveniently deal with so it is divided into **millirems** (mrem) each of which is 1/1000 of a REM.

A **rad** is a measure of the quantity of radiation absorbed by materials.

Radioactive contamination occurs when a person or object has been exposed to a radioactive source and is made radioactive by induced radioactivity or is covered with radioactive particles. Particles can be washed off but if improper respiratory protection is worn, there is a chance that radioactive particles may be inhaled. Radioactive particles lodged in the lungs is a serious health hazard.

Radioactive Exposure of the General Public:

ESTIMATED DOSE RATES IN THE UNITED STATES (1970)

SOURCE	AVERAGE DOSE RATE (mrem/year)
environmental	
natural	102
fallout	4
nuclear power	0.003
medical	
diagnostic	72
radiopharmaceuticals	1
occupational	0.8
miscellaneous	2
total	182 mrem

Time exposed, distance from a radioactive source, and shielding used all combine to limit the amount of radiation you are exposed to at a radioactive incident. It should be obvious that the shorter the time you are at a site, the less radiation your body can absorb. In this way, exposure to individuals can be controlled by work schedules.

Your exposure to radioactive particles and rays (measured in roentgens) changes with the distance from a radioactive source. The rate that radiation drops according to distance from its source is described by the "inverse square law." This "law" is a formula which states that the concentration is a function of 1 divided by the square of the distance from the source. The formula is saying that, as particles travel from their source, they spread out and so, are less concentrated. A source that is measured as releasing a dangerous concentration of radiation in its immediate proximity may pose no threat to workers outside of the incident hot zone.

Shielding is another way to limit exposure to radiation. Shielding is any material or equipment designed to limit the penetration of radioactive particles or energy. Alpha particles have a low penetration potential and workers require very little shielding to protect them from alpha particles. Beta particles are more penetrative and require a higher, thicker, denser shielding to protect workers. Gamma rays are highly penetrative and require heavy lead shielding to protect workers. Shielding can be had in the form of "portable" shields that look like sections of office cubicle walls; transparent plastics; and lead-lined or impregnated clothing.

LD_{50}/LC_{50}

Toxicity information is often expressed as the dose of the compound that causes an effect in a percentage of the exposed subjects, which are mostly experimental animals. These dose-response terms are often found in Material Safety Data Sheets (MSDS) and other sources of health information. One dose-response term that is commonly used is the lethal dose 50 (LD_{50}), the dose which is lethal to 50% of an animal population from exposure by any route other than inhalation when given all in one dose. Another similar term is the lethal concentration 50 (LC_{50}), which is the concentration of a material in air that on the basis of respiratory exposure in laboratory tests is expected to kill 50% of a group of test animals when administered as a single exposure (usually 1 hour). Exhibit I lists a number of chemicals that may be encountered in dealing with hazardous materials incidents, and the reported acute LD_{50} values of these compounds when they are administered orally to rats.

From Exhibit I, it can be seen that a dose of 3,000-3,800 mg/kg tetrachloroethylene is lethal to 50% of rats that received the compound orally; however, only 6.4 to 10 mg/kg of sodium cyanide is required to produce the same effect. Therefore, compounds with low LD_{50} values are more acutely toxic than substances with larger LD_{50} values.

The LD_{50} values that appear in an MSDS or in the literature must be used with caution by emergency medical personnel. These values are an index of only one type of response and give no indication of the ability of the compound to cause nonlethal, adverse or chronic effects. Furthermore, LD_{50} values typically come from experimental animal studies. Because of the anatomical and physiological differences between animals and humans, it is difficult to compare the effects seen in experimental animal studies to the effects expected in humans exposed to hazardous materials in the field. Therefore, emergency medical personnel should remember that the LD_{50} and LC_{50} values are only useful for comparing the relative toxicity of compounds and should only be used to determine if one chemical is more toxic than another.

Exhibit I
Acute LD_{50} Values for Representative Chemicals When Administered Orally to Rats

Chemical	Acute Oral LD_{50} (mg/kg)*
Sodium cyanide	6.4-10
Pentachlorophenol	50-230
Chlordane	83-560
Lindane	88-91
Toluene	2,600-7,000
Tetrachloroethylene	3,000-3,800

*Milligrams of the compound administered per kilogram body weight of the experimental animal.

Responses to toxic chemicals may differ among individuals because of the physiological variability that is present in the human population. For example, an individual may be more likely to experience an adverse health effect after exposure to a toxic chemical because of a reduced ability to metabolize that compound. The presence of preexisting medical conditions can also increase one's susceptibility to toxic chemicals. Respiratory distress in patients or workers with asthma may be triggered by exposure to toxic chemicals at lower concentrations than might be expected to produce the same effect in individuals without respiratory disease. Factors such as age, personal habits (i.e., smoking, diet), previous exposure to toxic chemicals, and medications may also increase one's sensitivity to toxic chemicals. Therefore, exposure to concentrations of toxic compounds that would not be expected to result in the development of a toxic response

in most individuals may cause an effect in susceptible individuals. Not all chemicals, however, have a threshold level. Some chemicals that produce cancer (carcinogens) may produce a response (tumors) at any dose level. Any exposure to these compounds may be associated with some risk of developing cancer. Thus, literature values for levels which are not likely to produce an effect do not guarantee that an effect will not occur.

Exposure Limits

The various occupational exposure limits found in the literature or in an MSDS are based primarily on time-weighted average limits, ceiling values, or ceiling concentration limits to which the worker can be exposed to without adverse effects. Examples of these are listed in Exhibit II.

Exhibit II
Occupational Exposure Limits

Value	Abbreviation	Definition
Threshold Limit Value (3 Types) (ACGIH)*	TLV	Refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.
1) Threshold Limit Value—Time-Weighted Average (ACGIH)*	TLV-TWA	The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
2) Threshold Limit Value—Short-Term Exposure Limit (ACGIH)*	TLV-STEL	The concentration to which workers can be exposed continuously for a short period of time without suffering from: 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded.
3) Threshold Limit Value—Ceiling (ACGIH)*	TLV-C	The concentration that should not be exceeded during any part of the working exposure.
Permissible Exposure Limit (OSHA)**	PEL	Same as TLV-TWA.
Immediately Dangerous to Life and Health (OSHA)**	IDLH	A maximum concentration (in air) from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects.
Recommended Exposure Limit (NIOSH)***	REL	Highest allowable airborne concentration is not expected to injure a worker; expressed as a ceiling limit or time-weighted average for an 8- or 10-hour work day.

*American Conference of Governmental Industrial Hygienists
**Occupational Safety and Health Administration
***National Institute for Occupational Safety and Health

The values listed in Exhibit II were established to provide worker protection in occupational settings. Because the settings in which these values are appropriate are quite different than an uncontrolled spill site, it is difficult to interpret how these values should be used by emergency medical personnel dealing with a hazardous materials incident. At best, TLV, PEL, IDLH, and REL values can be used as a benchmark for determining relative toxicity, and perhaps assist in selecting appropriate levels of Personal Protective Equipment (PPE). Furthermore, these occupational exposure limits are only useful if the appropriate instrumentation is available for measuring the levels of toxic chemicals in the air at the chemical spill site. Of the above occupational exposure limit values, only the OSHA values are regulatory limits. The ACGIH values are for guidance only and are not regulatory limits. In addition, the ACGIH limits have certain caveats that may or may not affect the usefulness of the values. Some of these conditions are individual susceptibility or aggravation of a preexisting condition. Nevertheless, all emergency medical personnel responsible for the management of chemically contaminated patients should be familiar with these concepts because they will be encountered in various documents dealing with patient care or the selection of PPE.

This brief discussion highlights some fundamental concepts of toxicology. Emergency medical personnel responsible for managing chemically contaminated patients are encouraged to obtain further training in recognizing and treating health effects related to chemical exposures. Also, a list of general references in toxicology is provided at the end of this section that will allow emergency medical personnel to undertake a more in-depth examination of the principles of toxicology.

Confined Space Hazards

A confined space as defined by OSHA 29 CFR-1910.146 and NJPEOSH (NJAC 12:100-17.1) is an enclosed space which:

Is large enough and so configured that an employee can bodily enter and perform assigned work;

Has limited or restricted means for entry or exit (some examples are tanks, vessels, silos, storage bins, hoppers, vaults, pits and diked areas);

Is not designed for continuous employee occupancy; and

Has one or more of the following characteristics:

Contains or has a known potential to contain a hazardous atmosphere;

Contains a material with the potential for engulfment of an entrant;

Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downward and tapers to a smaller cross-section; or,

Contains any other recognized serious safety or health hazard.

Confined Space Rescue

People can die in confined spaces. Many deaths occur due to changes in the atmosphere after initial monitoring. Since rescue is seldom planned and usually consists of spontaneous reaction in an emergency situation, more than 60% of deaths occur among would-be rescuers. Conditions in familiar areas, and especially confined spaces, can change. Protective measures may be neglected because "I've never had a problem before" or "I'm so experienced that the job will only take a minute or two." These attitudes have frequently proved fatal.

Injuries and fatalities can occur in confined spaces in numerous ways. Some of the hazards are:

Atmospheric Hazards

Asphyxiating Atmospheres

OSHA uses the term "asphyxiating atmosphere" when referring to an atmosphere which contains less than 19.5 percent oxygen. 19.5% is not enough oxygen to supply an entrant's respiratory needs when performing physical work. These atmospheres need not contain toxic materials. For example, the oxygen in a space may have been absorbed by materials, such as activated charcoal, or consumed by a chemical reaction, such as the rusting of a vessel or container. In another situation, the original atmosphere may intentionally have been wholly or partly inerted

using such gases as helium, nitrogen, methane, argon, or carbon dioxide. Victims often are unaware of their predicament until they are incapable of saving themselves or even calling for help.

Example: A worker in Oklahoma prepared to enter a molasses tank. The atmosphere had not been tested and no respirators, retrieval lines or harnesses were provided. Following a long-standing practice at the company involved, employees removed the tank lid and allowed the tank to "ventilate naturally" for several hours before entering. No testing of the tank's atmosphere was undertaken. The first entrant reported feeling ill as soon as he entered, and collapsed almost immediately. Two "standby" workers, required by the plant's SOP entered to rescue him. Each of them collapsed after saying they felt dizzy. All three employees died.

Toxic Atmospheres

The term "toxic atmospheres" refers to atmospheres containing gases, vapors or fumes known to have poisonous physiological effects. The toxic effect is independent of the oxygen concentration, which may in fact be greater than 20 percent. The most commonly encountered toxic gases are carbon monoxide and hydrogen sulfide.

Some toxic atmospheres may have severe harmful effects which may not appear until years after exposure, while others may kill quickly. Some can produce both acute and chronic effects. For example, while carbon disulfide at low concentrations may exhibit no immediate sign of exposure, it can cause permanent and cumulative brain damage as a result of repeated "harmless" exposures. At higher concentrations, it can kill quickly.

Example: An employee entered a solvent storage tank to remove toluene residues. The tank was 20 feet tall and 10 feet in diameter. The employer had rented a self contained breathing apparatus (SCBA) and showed the employee how to use it, but again the tank atmosphere had not been tested, nor had any provisions for rescue been made. The employee was provided with a length of rope for his descent into the tank. The employee could not fit through the tank's opening while wearing the SCBA, so the employer decided that the SCBA would be lowered to him, using the same rope, after the employee reached the bottom of the tank. After entry, the employer lowered the SCBA, but the worker collapsed before he could put it on. A call for help was sent to the city fire department.

Because of the small opening, the firemen who responded to the rescue call could also not enter the tank while wearing SCBA. They decided that only by cutting open the tank could they possibly rescue the victim. Despite the precautions taken by the firemen during the cutting of the tank, the toluene vapor in the tank ignited. The explosion killed one fireman and injured 16 others. It was later determined that the entrant was already dead due to the toxic effects of toluene and lack of oxygen before the explosion occurred.

Flammable or Explosive Atmospheres

OSHA defines the term "flammable or explosive atmosphere" as an atmosphere which poses a hazard because flammable gases, vapors or dusts are present at a concentration greater than 10 percent of their lower flammable limit. This last subcategory of hazardous atmospheres includes atmospheres containing gases such as methane or acetylene; vapors of solvents or fuels such as carbon disulfide, gasoline, kerosene or toluene; or dusts of combustible materials.

Example: Workers at a refinery in Puerto Rico were cleaning a large storage tank. Since it had last been cleaned, the tank had been used at various times to store gasoline, gas oil, and light and heavy crude oils. The employer expected that the tank would contain residues from these liquids.

The procedures, tools, and all other equipment to be used for entry were prescribed by an entry permit prepared by the parent company, not by the refinery. Under the terms of the entry permit, workers were required to use air-supplying respirators, lifelines, exposion-proof lighting, and were also required to test the atmosphere for flammable conditions before and during entry. However, no one at the refinery had been made accountable for compliance with the permit.

Employee accounts indicate that the refinery management had originally followed permit procedures, but that permit requirements were generally ignored the day of the incident.

For example, even though it was known that the work could generate a flammable atmosphere and that only explosion-proof lighting was allowed where a flammable atmosphere could exist, only two of the twelve lamps illuminating the inside of the tank were explosion-proof; no lifelines were available; and no atmospheric monitoring was done.

Five employees were in the tank when it exploded and burned briefly. The workers outside the tank were unable to help them. The fire burned out in just seconds, but by then four of the workers were dead. The fifth entrant died of massive respiratory injuries several days later.

Engulfment

"Engulfment" refers to situations where a confined space entrant is trapped or enveloped, usually by dry bulk materials. The engulfed entrant is in danger of asphyxiation, either through filling of the victim's respiratory system as the engulfing material is inhaled, or through compression of the torso by the engulfing material. In some cases, the engulfing materials may be so hot or corrosive that the victims sustain fatal chemical or thermal burns, but are never buried below a point at which they can breathe.

Example: A group of employees of a Nebraska sawmill entered a 40 foot high storage tank, thought to be nearly full of sawdust. Entry was made through a small opening near the top. One of these workers suddenly disappeared. He had fallen into an air pocket in the sawdust. Rescue operations began immediately, but the worker died of asphyxiation by the time his body was recovered.

Two years earlier, this same employee had narrowly escaped death in a similar incident only because his foreman had seen him sinking into the sawdust and managed to grab his hand and pull him out.

OSHA's report on the fatal incident quotes the sawmill's report of its own investigation of the earlier, non-fatal incident, which concluded that the company "decided for bin workers to use a safe rope." The only "rope" on hand at the time of the fatal incident was a cord formed by knotting together pieces of rotted sash cord. The employees did not use this rope because they recognized that it was useless and also, in the words of the employees, "because it was too much trouble."

Mechanical Hazards

Accidents have resulted in confined spaces when employers failed to isolate equipment from sources of mechanical or electrical energy. In each case reviewed, death resulted from mechanical force injury, such as the crushing of the victim. The current preventive action is to secure the machinery or equipment so that it will not be inadvertently activated while employees are in the confined space. This procedure is commonly called "lockout".

Example: A workman entered the bag house in the dust collection system of an Ohio basic-oxygen steelmaking furnace to check the condition of the bags. He stepped onto the dust conveyer, which was not supposed to be operating at the time, and was caught in the machinery. The employee died before rescuers could remove him from the auger pipe conveyer.

Untrained Rescuers

A high percentage of confined space accident victims have been untrained rescuers. Indeed, in some cases the unsuccessful rescuers die, while the initial entrant recovers. The likelihood that good intentions and poor preparation will lead to tragedy has led OSHA to establish criteria for rescue which would protect co-workers or volunteers from accidental injury or death.

Example: A Connecticut fuel company owner sent an employee into a large underground vault. The vault's only means of access and ventilation was straight down through six feet of 30-inch steel culvert pipe. The employer reportedly told police that "he heard a clunk" soon after his employee descended into the vault. Concerned because he had lost contact with this employee, he sent in a second employee. This rescuer collapsed at the foot of the ladder. The employer then directed a third employee to go in and help the others. The second rescuer collapsed before he got to the bottom of the ladder, with one leg caught between two ladder rungs. This hung the employee upside-down, interfering with rescue efforts by the firemen who were summoned to the scene.

Both "rescuers" were pronounced dead at the scene. The initial entrant died two days later from massive brain damage caused by prolonged oxygen deprivation.

OSHA subsequently learned from police department records that about six years earlier, two employees were overcome by lack of oxygen in a similar vault operated by the same employer. In that case, the entrants were rescued without loss of life. Unfortunately, the employer had not taken advantage of the close call warning by implementing procedures which would have prevented subsequent incidents.

As far as confined space work is concerned, actions taken before an emergency are the best emergency actions.

Module 1

FOUNDATION

Section 4

SITE SET-UP

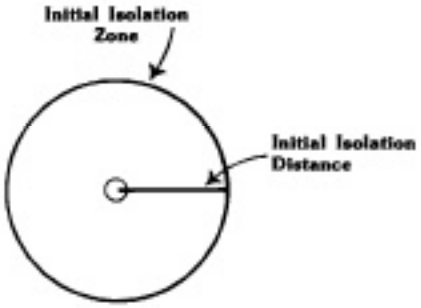
ISOLATION/PROTECTIVE ACTION DISTANCE

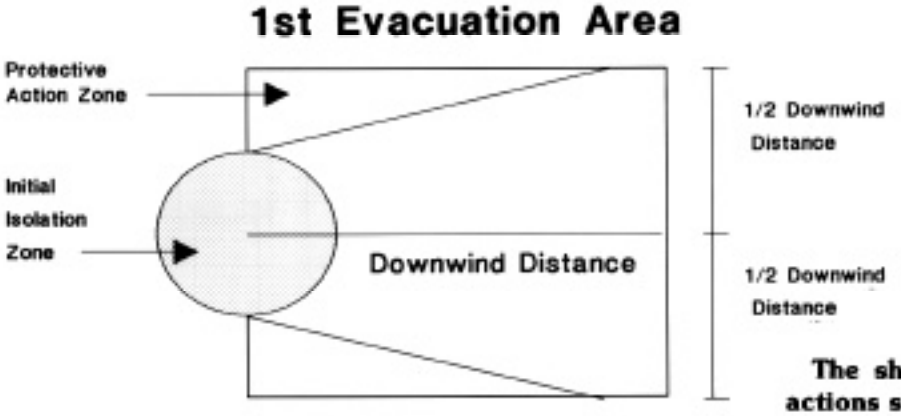
Prior to an anticipated air release of a hazardous material, a circular evacuation strategy may be appropriate. Evacuation might also be based on prevailing wind conditions. These strategies are illustrated below. When a large number of people are involved, the evacuation should be staged, that is, areas closest to the site should be evacuated first and the evacuation zone gradually expanded.

ISOLATION DISTANCE

Determine if the incident involves a SMALL or LAGE spill. Generally a SMALL SPILL is one which involves a single, small package (i.e. up to a 55 gallon drum), small cylinder, or a small leak from a large package. A LARGE SPILL is one which involves a big spill from an opening in a large package or spills from many small packages. (See the "Background" information for this table for more explanation.)

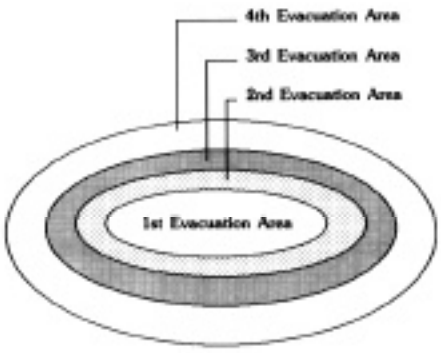
Look up the initial ISOLATION distance. Direct that all persons move, in a crosswind direction, away from the spill to that distance.





The shape of the area in which protective actions should be taken (the Protective Action Zone) is shown in this figure. The spill is located at the center of the small circle. The circle represents the ISOLATION zone around the spill.

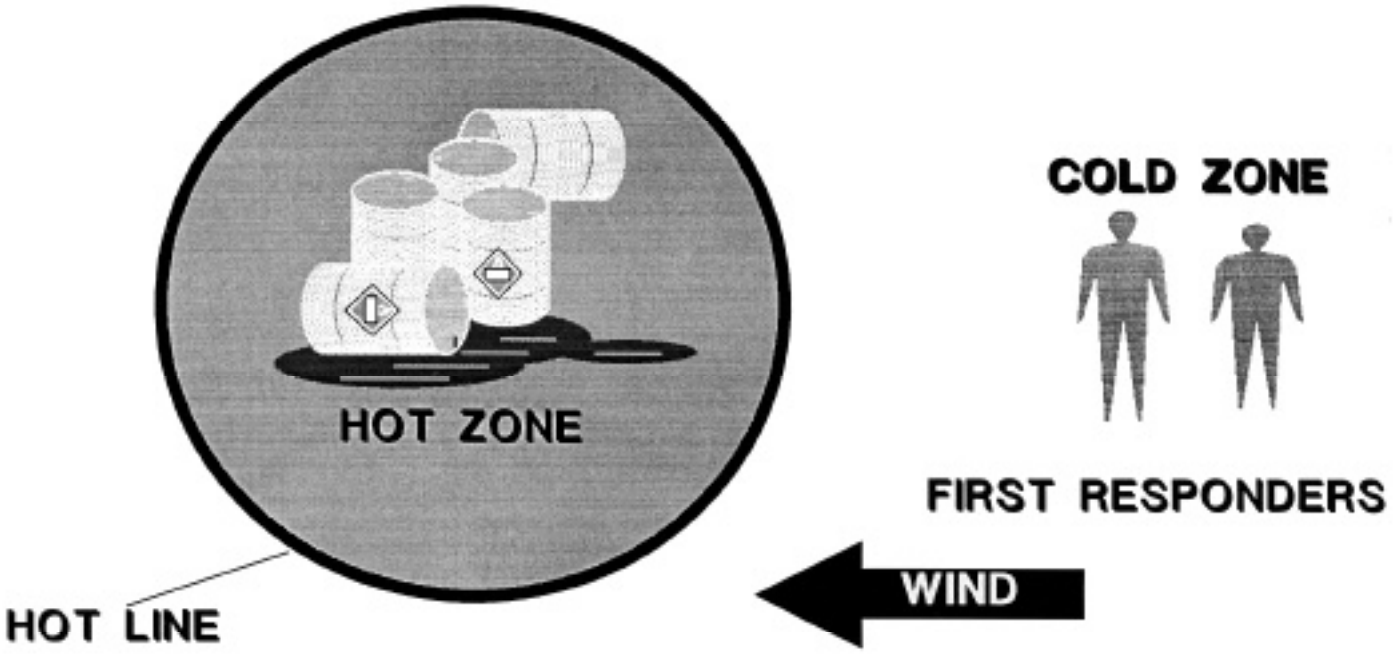
STAGED EVACUATION



Large scale evacuations require that the area closest to the incident be evacuated first. Then the area can be expanded by stages.

SITE CONTROL

FIRST RESPONDER



ISOLATE THE INCIDENT AND CALL FOR ASSISTANCE

Awareness trained responders will NOT enter the hot zone

Module 1

FOUNDATION

Section 5

PERSONAL PROTECTIVE EQUIPMENT

Introduction

Dealing with a hazardous materials incident is risky business. The first responder initially deals with unknown factors which can clearly be hazardous to his health. As such, he must handle the incident differently than he would normally and with much more caution.

Greater care should be given to personal protection of the emergency services personnel with more detail given to approach and operational procedures. The availability of proper protective equipment, or the lack of it, has a direct bearing on how and if an approach is made; what the incident mitigation objectives can be; how work area assignments are made and defined; and how the establishment of working limits (operating time, work zones, and personal protection) are determined.

The most critical factor here is the life threat to operating personnel. Without knowledge of exactly what personal protection equipment is necessary for the materials involved in the incident and the protective limits of the equipment, the incident response team can get into immediate serious trouble. The first concern should be the proper protection of the first responder.

The First Responder at Hazardous Materials Incidents

The first consideration of all operating personnel must be their own ability to survive the incident. That thought sounds simple enough. You would think that if you're out in the street, some distance from the incident in fresh air, that you're okay. This may not necessarily be true! The products involved in hazardous materials incidents can be colorless, odorless, tasteless, and you may not feel their presence as they envelop you in a destructive cloud that may not be noticed until years later. The question of operating personnel safety is dependent upon three factors:

- what products are involved in the incident
- what are their associated risks under the incident conditions
- what level of protection should operating personnel have to deal with the incident.

The first and second factors can only be answered through discovery of what products are involved. **If, and as long as, the products remain unknown,** then a worse case probability should be assumed. Once the product or products are known and the risks have been evaluated accordingly, **then** the level of personal protection can be set to match the needs of the operational objectives.

All operating personnel **must** therefore understand what constitutes personal protection or personal protective equipment. This includes all personnel who work in or near the incident site, regardless of whether they be the mayor, police officers, emergency medical services personnel, or firefighters.

The typical first responder will arrive on the scene in the least acceptable level of protection. If it's the Mayor, then it's his emergency services uniform (a sport coat and tie). If it is a police officer it will be a blue uniform with a badge and a side arm for personal protection. Emergency medical personnel will report to the scene with a medical kit, a stethoscope and other implements sticking out of numerous pockets. The firefighter will roll onto the scene in full structural fire fighting gear with hoses and tools ready at hand. **Unless the product exposure risk is known and determined to be no risk at all, or of little risk to personnel, these people should be denied access to the incident site, and their proximity to the operational area should be clearly defined and closely monitored.**

The psychological feeling of invulnerability is a significant factor when dealing with emergency services personnel. The danger must always be in the mind of the incident commander as a concern during operations.

Everyone is vulnerable unless they:

- are properly protected before they enter the incident site
- are aware of the risks present at the site
- know what objectives can be realistically attained.

The Difference Between Structural Fire Fighting PPE and Hazardous Materials PPE

To better understand why structural fire fighting equipment and the Mayor's sport jacket are inadequate for the majority of hazardous materials incidents, we have to look at the risks these incidents present to the wearer. There is a difference between normal clothing, structural fire fighting clothing, and personal protective equipment designed for hazardous environments, which may contain acids, bases, poisons, radioactive materials, asphyxiants, thermal products, or biological contaminants.

The Globe Manufacturing Company, one of the foremost manufacturers of firefighter protective clothing, includes this warning in its literature:

> "Outer shell, Moisture Barrier, and Thermal Barrier meeting all requirements of NFPA 1971 must be utilized and all garment closures must be fastened when in use. DO NOT keep this garment in direct contact with flames or molten metal. DO NOT USE FOR PROXIMITY OR FIRE ENTRY APPLICATIONS OR FOR PROTECTION FROM CHEMICAL, RADIOLOGICAL OR BIOLOGICAL AGENTS. Keep clean—soiling will reduce protective qualities. Maintain and alter only in accordance with manufacturer's instructions. No protective clothing can provide complete protection from all conditions—use extreme care for all emergency operations. Failure to comply with these instructions may result in serious injury or death."

Normal clothing, and even structural fire fighting clothing, **do not afford adequate protection against the contaminants** mentioned. The clothing may absorb liquids, attract dust-like solid particles, and possibly hold gases within the clothing fibers or allow a pass through of gases to the body.

Specially designed chemical protective equipment, however, is constructed of special materials which prohibit penetration, permeation, and degradation of the suit materials by various hazardous chemicals, and are divided into two types:

- fully encapsulating.
- nonencapsulating.

The awareness of the limitations of a first responder's clothing, and the risks present to his health will make the difference between a safe, effective operation, and one in which the first responder becomes a part of the problem. **If the chemicals involved at the incident site are beyond the operational responder's capability, then they should call for specialized hazardous materials help immediately and do not enter the site.**

Clothing which is specifically designed for hazardous materials incidents, and for use with specific types of chemicals, falls into four categories: Level A, Level B, Level C, and Level D. The predominant physical, chemical, and toxic properties of a chemical, or chemicals, involved in a hazardous materials incident will dictate the specific type of chemical protection required. The guidelines for the use of these various levels of protection are as follows:

Level A: MAXIMUM PROTECTION

Should be worn when the highest level of respiratory, skin, and eye protection is required.

Level A Conditions:

- Unknown gas concentrations.
- Known extremely toxic or corrosive gases.
- Possible or expected skin exposure to toxic or corrosive liquids, gases or solids.
- IDLH Atmospheres.

Level A Configuration:

- Fully-encapsulating chemical resistant suit completely encloses user and SCBA.

Level B: HIGH RESPIRATORY PROTECTION

Should be worn when the highest level of respiratory protection is needed but a lesser level of skin protection is required. (SPLASH PROTECTION)

Level B Conditions:

- Known contaminant levels below IDLH concentrations.
- Atmosphere with less than 19.5% oxygen.
- Chemical concentrations which are above the TLV level.

Level B Configuration:

- Chemical resistant clothing including boots and gloves, that generally do not fully enclose user and SCBA.

Level C: LIMITED RESPIRATORY PROTECTION

Should be worn when the criteria for using air-purifying/respirators has been met.

Level C Conditions:

- Greater than 19.5% oxygen.
- Contaminant level below IDLH and above TLV.
- Skin contact hazards are minimal or do not exist.

Level C Configuration:

- Level B and Level C differ only in type of respiratory protection required. The chemical protective clothing requirements are the same.

Level D: MINIMUM PROTECTION

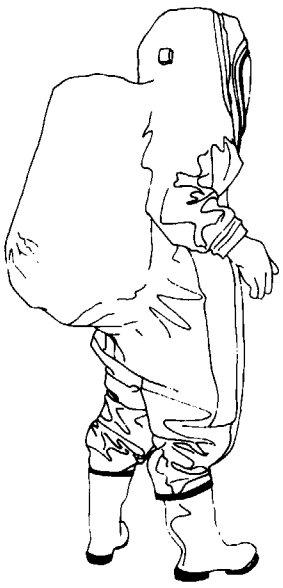
Should be worn only as a work uniform and not on any site with a respiratory or skin hazard.

Level D Conditions:

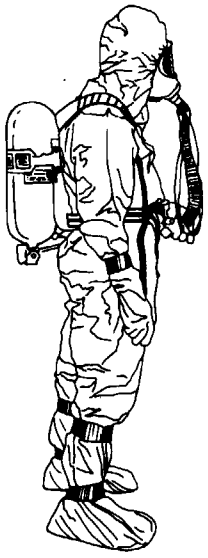
- No possibility of respiratory exposure.
- No possibility of skin exposure.
- No contaminant levels below TWA.

Level D Configuration:

- Standard Work Uniform, including structural firefighter protective equipment.

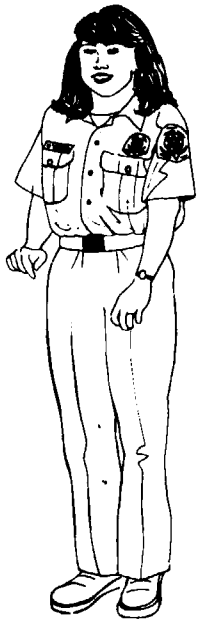


Level A



Level B

Level C



Level D

Note: OSHA Final Rule 29 CFR Part 1910(q)(3)(iv)

(iv) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

The level of protection necessary for the hazardous materials responder at an incident should be based on the following factors which must be critically assessed:

- The type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- The potential for exposures to substances in the air; to splashes of liquids; and to direct contract with materials or substances due to the work being done at the incident site.

Personal Protective Equipment for the First Responder

Minimum personal protective equipment requirements for the first responder, of necessity, revolve around structural fire fighting equipment. This is because it is the most readily available—not because it is the best protection. Police, fire fighters and emergency medical personnel are usually the first to arrive at the incident scene and this is the type of protective equipment usually available to them. The term "full protective clothing" is synonymous with structural fire fighting clothing, or protective equipment as it is known in the fire service. Yet—"full protective clothing" (structural fire fighting clothing) at hazardous materials incidents is **NOT** the same as full personal protective equipment which is specifically designed for hazardous materials environments.

RESPIRATORY PROTECTION

The use of respiratory protection at a hazardous materials incident is mandatory. The level (degree) of respiratory protection must be in compliance with both OSHA regulations, NIOSH guidance documents, standard operating procedures, and, most of all, be suited for the hazard and the wearer. Air purifying respirators (APR's) and self-contained breathing apparatus (SCBA) are the only two forms of respiratory protection that is addressed.

Air Purifying Respirators (APR's)

The use of APR's is limited to the available approved cartridges or canisters. Both cartridges and canisters have very limited use, if used at all, during a hazardous materials incident. This is due to several very critical factors:

- APR's are negative system, thus allowing for infiltration of contaminated air into the mask,
- APR's have very limited use times, which does not afford the wearer any substantial protection,
- APR's require individual fit testing prior to actual use and wearing,
- APR's do not protect the wearer from unknown air contaminants,
- You cannot be sure that the contaminants at the emergency will not elevate nor control the oxygent content of the atmosphere.

As stated in 4 above, in order for APR's to provide the safe and proper level of protection necessary for the wearer to be protected, the wearer must know both the contaminant type and concentration. This is not the case for the emergency worker or hazardous materials responder.

As such, this form of respiratory protection is reserved for use by those workers that are outside both the hot and warm zone, and who have been properly fit tested as well as supplied with the appropriate canister or cartridge, based upon verifiable air monitoring. ONLY UNDER THE DIRECT SUPERVISION OF THE ON SCENE COORDINATOR OR OTHER HEALTH OR SAFETY OFFICER CAN THESE DEVICES BE USED AT A HAZARDOUS MATERIALS INCIDENT.

Self-Contained Breathing Apparatus (SCBA)

The SCBA affords the wearer the best, and highest, level of respiratory protection (Level B and Level A). It provides the wearer with his or her personal air supply, totally segregated from the environmental air.

Although there exist various makes, models, styles, and manufacturers, the important thing to remember is that there exists only three types:

- Re-breathers,
- Demand,
- Pressure Demand.

RE-BREATHERS are basically air generators. The wearer is supplied with a closed, recirculating system, whereby exhaled air is sent through a carbon dioxide scrubber, and returned, after a small "injection" of oxygen. The wearer also carries a small canister of oxygen in the unit. THESE UNITS ARE NOT TOTALLY POSITIVE PRESSURE AND ARE NOT APPROVED FOR HAZARDOUS MATERIAL RESPONDERS.

The DEMAND type, NOT APPROVED FOR USE AT HAZARDOUS MATERIAL INCIDENTS, only provide positive pressure to the user upon exhalation. As such, the possibility exists that the wearer may breathe contaminated air.

The PRESSURE DEMAND type is the ONLY TYPE APPROVED FOR USE AT HAZARDOUS MATERIAL INCIDENTS, since positive pressure is always present in the system, thus preventing the wearer from inhaling environmental air.

Lastly, the hazardous materials responder may be subject to or required to work using an air line system. In this set-up, the worker is "tethered" to a fixed air supply with a pressurized airline. The wearer may also be equipped with a dual mode operating SCBA or an escape pack. However, UNDER ANY AIRLINE SET-UP THE WORKER MUST BE SUPPLIED WITH A MINIMUM OF A FIVE MINUTE ESCAPE PACK. Normally, however, this operational set-up is used during extensive containment or remedial operations.

THERE IS VERY LITTLE COMPARISON BETWEEN THE PROTECTION AFFORDED BY STRUCTURAL FIRE FIGHTING CLOTHING AND FULLY ENCAPSULATING CHEMICAL SUITS OR OTHER EQUIPMENT SPECIFICALLY DESIGNED TO BE USED IN CHEMICAL SPILL ENVIRONMENTS.

Minimum Personal Protective Equipment Requirements:

The National Fire Protection Association (N.F.P.A.) N.F.P.A. 1971, Standard on Protective Clothing for Structural Fire Fighting states that:

> "Full protective clothing includes the helmet, self-contained breathing apparatus, coat and pants customarily worn by fire fighters (turn-out or bunker coat and pants), rubber boots, gloves, bands around legs, arms, and waist, and face mask, as well as covering for neck, ears and parts of the head not protected by the helmet, breathing apparatus or face mask."

Additional Personal Protective Equipment considerations:

Additional recommendations to insure that all exposed areas of skin are covered are:

- Use ear flaps or helmets in the down position.
- Have collar up and neck covering flap on collar in place.
- Have 3/4 length boots pulled up.
- Turnout pants with boots are a better choice than 3/4 length boots because they provide protection to the groin and buttocks area.
- Have gloves that fully cover the wrists. Gloves must also be selected in relation to the material involved. Two sets of gloves should be worn; an inner and an outer glove. Gloves made of synthetic fibers, cotton or leather should not be used as they can absorb liquids or other contaminants which may come into contact with the skin. Once the chemical is absorbed into the gloves it is usually not possible to decontaminate them.
- Wear a flame-resistant Nomex hood.
- PASS (personal alert safety system) devices should be provided to each member involved in the operational aspects of the incident.
- Inspection should be made of seams, stitches and binding surface abrasions, zippers and closures, head gear and eye protection before entering the site and after decontaminations to determine integrity and possible damage.

It is important to remember that this level of protective clothing **does not** provide adequate protection against chemical permeation and degradation. In fact, some chemical vapors could cause unseen and unknown degradation of this type of protective clothing which may not become apparent until some time after the exposure incident. Furthermore, because this type of protective clothing is generally made of fibrous, woven material, it may not be possible to fully decontaminate this equipment when exposed to dusts or particulate matter.

Full protective clothing of the type described here should be considered for use ONLY when operating in a DEFENSIVE mode and no contact with the hazardous material is intended.

REMEMBER:

"Full protective clothing," as referenced to structural fire fighting clothing, can be worn at hazardous materials incidents, but it should not be worn as a defense against hazardous chemical effects. It IS NOT designed for the potential risks, and operating requirements within the HOT zone or the WARM zone. It can be utilized upwind of the incident and outside of any contamination zone. It can also be used in cold zones where support activities are being performed, and it is only to be worn during defensive activities.

Recognizing Personal Protective Equipment Operating Limitations

"First responders must be able to identify the hazards to health and safety created by hazardous materials. They must recognize their limitations based on lack of specialized protective clothing, equipment and training."

This statement from the State of Arizona *Hazardous Materials Reponse Training,* Level I training manual implies a broad responsibility for first responders. It is also a very general statement about the hazardous materials problem. What are the specific limitations the first responder should be aware of? Some concerns have already been covered in previous sections and will be more clearly identified to increase awareness of the personal risks relative to protective clothing. Limitations on, and factors which determine the level and choice of personal protective equipment depend on the hazardous materials involved at the incident site; the prevailing conditions at the site; and the complicating factors which impact on operations objectives.

The Hazardous Materials Involved:

The form of hazardous material involved at an incident site will have a direct bearing on the choice of personal protective equipment, or the decision to withdraw from the area. There are three broad categories of hazardous material to consider: chemical materials, biological (etiologic) materials, and radioative materials.

These categories can be defined as follows:

- **Chemical Materials:** Are materials which are hazardous because of their chemical and physical properties.
- **Biological Materials:** Are organisms which can have a dangerous effect on life or the environment, and they can exist in normal ambient environments.
- **Radioactive Materials:** These are materials which emit ionizing radiation.

Each of these categories and the risks associated with that particular category of hazardous material will influence the choice of personal protective equipment. In addition, the type of material, as referenced to these categories, can have far reaching effects on how personal protective equipment is used (operationally), how and whether it can be decontaminated, and whether it can be reused during the operation. An incident involving radioactive material, for example, can lead to the disposal of all personal protective equipment utilized during the incident—**and it can never be used again.** This can certainly be an expensive proposition for many communities.

The physical state of the hazardous material involved is also a factor of concern in choosing protective equipment. Materials, or elements, can be classified into three basic states of matter: gases, liquids, and solids. Each of these states can affect your choice of equipment and how you wear it. As an example, large solids are not as much of a problem as liquids, gases or fine dusts (solid particles) and vapors, which can permeate or penetrate protective clothing as well as contaminate it.

Incident Conditions:

Hazardous materials incident conditions can play a major role in the choice of personal protective equipment necessary for the operation. The incident risks, operational problems, and objectives, establish specific demands on personnel and their personal protective equipment. Some of the conditions which must be evaluated are:

- The inability to identify the material or materials involved at the incident site. In this instance no immediate approach should be made and a "worst case" possibility should be considered.
- Whether the incident problem involves a leak, spill, or a vapor release. Each of these factors can make a big difference in defensive operational objectives, and therefore, influence the choice of protective clothing needed.
- A fire in progress or the risk of a fire developing during operations because of the product involved. This factor usually broadens the overall scope of the operation because it is an added complication beyond simple confinement and clean-up. In this specific instance thermal personal protective equipment must be a definite consideration.
- An explosion or the risk of an explosion. As in the fire risk—overall operations are expanded in scope as soon as an explosion potential exists or one has occurred. Risk to operating personnel and civilians is the main concern. Thermal protection is a personal protective equipment consideration here, along with the possible damage that might occur to the protective equipment itself, thus eliminating its protective barrier.
- The risk or damage that a chemical product represents to the environment also affects the possible choices of personal protective equipment. In swampy areas where there is a spill you will most likely need 3/4 length boots rather than turnout pants for example. Work parties may have to be increased and split into multiple areas to confine spill runoff, thus requiring larger quantities of a specific type of protective clothing than might otherwise be necessary.
- The life safety of both civilians and incident operations personnel can determine the need for special protection, as well as the overall quantity of various levels of protective clothing, to deal with search, rescue, evacuation and defensive site control.
- The risk to property, and to the community as a whole, by the hazardous materials incident and the materials involved, can greatly affect the need for protective equipment to accomplish objectives geared to property and community preservation.
- Those methods of dealing with a hazardous materials incident, in and of itself, can be a determinant in the type of personal protective equipment necessary.

Complicating Factors:

The complicating factors at a hazardous materials incident can demand higher levels of personal protective equipment than are initially available to the first responder. They may also force a strategy decision to stand off from the incident rather than make an approach. The consequences of mixed commodities and the inability to determine the specific risk they represent is one example. Extremely limited access and escape corridors to an incident site where flammable or explosive materials are involved represents another decision point for both operations objectives and personal protective equipment adequacy.

Weather conditions can have significant impacts on the use and protective qualities of personal protective equipment. Rain, particularly a wind driven rain, can force contaminants through improperly secured openings, increase the possibility of permeation and penetration, and decrease visibility which in turn requires increased safety precautions. It can increase runoff and the size of the contamination zone. Weather conditions can complicate the incident problem for the incident commander and personnel to the point where the ability to cope is almost impossible. The need to evaluate its impact on protective equipment is always a factor of importance. The dynamics of weather require a constant re-evaluation of equipment adequacy and performance.

The protective equipment itself can also complicate operating conditions and require heightened safety requirements. Some of the factors which may make operations more difficult are:

- The inability to communicate effectively through face masks.
- The reduction of the field of vision by face masks.
- The loss of the sense of taste, smell and feeling because of the protective clothing envelope.
- Heightened emotions because of the type of operation and the feeling of confinement inside a protective suit.
- The inability to provide a totally chemical-resistant suit.

Some examples of complicating factors which can force a "stand off" strategy rather than an approach strategy are:

- Mixed commodities.
- Weather conditions.
- Site accessibility.
- Large amounts of debris following an explosion or accident which inhibit control efforts and movement within the site.
- The time of day.
- Terrain.
- Multiple incident complicating factors.

The Means By Which Personal Protective Equipment Performance May Become Compromised

Personal protective equipment used by the first responder may become defective leaving incident personnel vulnerable to the life threatening effects of hazardous chemicals. First responders' personal protective equipment must be inspected on a regular basis to determine if its reliability meets the minimum protection requirements to sustain the protective envelope. This inspection should include structural fire fighting clothing even if you have more advanced chemical protective clothing available.

Personal protective equipment may be affected in the following ways:

Chemical resistance is the ability of the chemical material or materials which make up the protective clothing and equipment to prevent or reduce degradation and permeation of the fabric by the attack chemical. In the case of structural fire fighting clothing this ability is extremely limited as compared to the numerous chemical products which may affect its integrity.

Degradation is a chemical action involving the molecular breakdown of the material due to contact with a chemical.

Permeation is a chemical action involving the movement of chemicals, on a molecular level, through intact material. There usually is no indication that this process is occurring.

Penetration is the movement of material through a suit's closures, such as zippers, buttonholes, seams, flaps or other design features. This also includes loose stitching, and rips and tears in personal protective clothing.

When To Remove Personal Protective Equipment (PPE) If It Has Been Contaminated

There is always the possibility that circumstances will cause PPE to become contaminated despite all precautions. Personnel should continually check each other to detect any contamination. The question of exactly when it is safe to remove contaminated PPE is dependent on several factors which can become quite complicated. The scope of the incident and the probability that multiple chemicals are involved must be considered. The dilemma goes beyond "when" to: where can protective equipment be removed; why should it always be removed when you leave the incident area; what should be removed based on the conditions; and who should do the removal of the equipment. Who, what, when, where, why and how are all critical questions which must be answered by the incident commander when dealing with the removal of personal protective equipment.

The removal of personal protective equipment should never be done within the incident "hot zone" or in any contaminated area until recognized professionals have determined, through the use of appropriate equipment, that the hazard risk has been removed. The incident commander is responsible for insuring that incident operations in the work area, the decontamination area, and any other areas used during the incident are safe.

If contaminated it will be necessary to decontaminate air cylinders for SCBA equipment after they have been removed and **before** they are refilled to insure that breathing air, the face piece and regulator, and the air filling station equipment are not contaminated. Under contamination threatening conditions the best approach is to stand off, secure the area, and turn the operation over to a private concern.

If personal protective clothing and equipment is removed within the incident site, even where it has been declared safe, incident commanders must continue to monitor personnel, who should be checking each other, to insure that symptoms of exposure are not becoming apparent. There is always the chance that something was missed. A test may have been performed incorrectly or a testing device may fail. The final responsibility again lies with the incident commander.

Regardless of the type of contaminated protective clothing, from structural fire fighting clothing or similar clothing to the most advanced fully encapsulating protective clothing (Level A), the removal of the protective envelope should be a closely monitored and planned exercise. It should only be done when it has been declared safe to do so, and only in an area which has been specifically designated and designed for the purpose. Where the risks to health are unknown or found to be serious—great care must be taken in removal supervision and personnel safety. Personnel are not safe until they have removed their protective clothing and equipment, and are returned to a safe and clean environment.

In summary,

Who?	ONLY the Incident Commander, his designee or the Safety Officer can order the removal of PPE.
What?	All equipment that passes the CONTAMINATION CONTROL POINT.
When?	EVERY time it crosses the CONTAMINATION CONTROL POINT.
Where?	A. ALWAYS in an area **designated and designed** for PPE removal (DECON) B. NEVER in "HOT ZONE" C. NEVER in a contaminated area
Why?	You are never safe from contamination until all protective equipment and contaminated clothing are removed.
How?	Under supervision of personnel assigned to perform decon.

Module 2

INCIDENT ASSESSMENT AND STRATEGIC PLANNING

Module 2

INCIDENT ASSESSMENT AND STRATEGIC PLANNING

Objectives:

Upon completion of this course the student will be able to:

1. NOTIFICATION AND RESPONSE

- Name 8 pieces of information on the first call prompting form.
- Name 8 elements of the preliminary and progress reports given to the dispatch center.
- Name and explain 4 roles of EMS at a HazMat incident with patients.

2. ROLES AND RESPONSIBILITIES

- List 3 goals of the EMS provider.
- List and explain the five sessions of the ICS.
- List 3 responsibilities of the EMS safety officer.

3. BASIC HAZARDS AND RISK ASSESSMENT TECHNIQUES

- Explain the DECIDE process.
- Name three reference sources for hazardous materials information.
- Demonstrate the use of 3 references for hazardous materials information.
- List 4 factors which affect the behavior of hazardous materials.
- Explain the difference between offensive and defensive actions.

4. INFORMATION MANAGEMENT

- List and explain 3 types of onsite records which should be generated and maintained for a HazMat incident.

Module 2

INCIDENT ASSESSMENT AND STRATEGIC PLANNING

Section 1

NOTIFICATION AND RESPONSE

RECEIVING THE ALARM

Every piece of information you can acquire about an incident **BEFORE** you arrive at the scene adds to your own effectiveness and safety. Your dispatcher plays a vital role in getting the facts you need to perform your job safely. Because certain kinds of information are so important, dispatchers should use a ***First Call Prompting Form*** to make sure all the necessary questions are asked. The dispatcher should also be familiar with the current "D.O.T. Emergency Response Guidebook" to immediately identify the nature of the hazardous material. Your emergency vehicle should have an identical ***First Call Prompting Form*** to make en route transfer of information smooth and complete. The following list contains the basic information on a ***First Call Prompting Form.*** Your unit may modify or change the list to suit your operation.

FIRST CALL PROMPTING FORM
FOR HAZARDOUS MATERIALS INCIDENTS

Hazardous Material Involved _____ 4 Digit DOT Number _____

Best upwind route _____

_____

_____

_____

Gas _____ Liquid _____ Solid _____

Flammable _____ Explosive _____ Toxic _____

Are materials burning? _____

Number of victims _____

Is rescue necessary? _____ From an enclosed _____ open _____ location

Available source of water _____

Who is Incident Commander? _____

Common radio frequencies _____

Upon arrival:

Ensure EMS command established

Upon arrival of your EMS units, it is imperative to identify who is the IC, and the location of the command post (CP) if not already known. If EMS is the first arriving unit then incident command must be established, and later transferred to the appropriate agency such as the FD.

EMS Command must be established and a first in report should be given to your dispatch center. The first in report would confirm the existence and location of the incident, units currently on scene, and the initial staging area for further units. Information must now be gathered for the Preliminary report to the dispatch center.

Give preliminary report

Preliminary report must provide the following information to the dispatch center in a calm and organized presentation:

- location of the incident and incident exposures
- types of vehicles and/or structures involved
- location of the command post and its designation
- location and designation of EMS command (Branch director)
- identification of the substance released
- presence of fire, spilled liquids, vapor leaks
- physical state of the substance
- incident description
- potential for incident escalation
- number of injuries/exposures and their triage priority
- potential for further injuries
- potential for injuries to rescuers/emergency workers
- units currently operating
- additional units required
- location of the staging area and best access route

Initiate EMS operations

EMS command must establish the various EMS operational groups as required. EMS may simply be on standby and only provide pre-entry and post-exit vitals for the HAZMAT Team and Rehabilitation services for all emergency workers. On the other hand, besides the above operations EMS may have to deal with actual injuries from the incident on site, or even injuries/ exposures downwind from the incident.

When required, EMS should initiate triage operations in a designated life safety area for arriving patients. This area should be free from the possibility of contamination. Hence, patients who are contaminated must pass through the DECON area first. A treatment area should next be established with appropriate supplies and personnel. Finally, a transport area should be created and staffed with loading personnel. Transport units should flow from EMS staging through this area for patients, and then to the departure point for hospital destination. Patients should be distributed equally to the various hospitals.

IF PATIENTS ARE NOT COMPLETELY FREE OF CONTAMINATION, THEN THEY MUST BE SEGREGATED FROM THE REST OF THE "CLEAN" PATIENTS!!!

CONTAMINATED PATIENTS MUST BE TRANSPORTED TO SPECIALIZED HOSPITALS ONLY, i.e. THOSE WITH HAZMAT DECON CAPABILITY. THESE HOSPITALS MUST BE ADVISED WITH PATIENT INFORMATION PRIOR TO DEPARTURE OF THE AMBULANCES.

AEROMEDICAL TRANSPORT IS NOT RECOMMENDED DUE TO THE POSSIBILITY OF CONTAMINATION OF THE HELICOPTER. THE ROTOR WASH OF THE HELICOPTER MAY ALSO INCREASE THE SPREAD OF ANY HAZARDOUS MATERIALS WHICH MAY CURRENTLY BE LOCALIZED.

Provide progress reports to EMS resources and dispatch center

Progress reports must be provided to the dispatch center every fifteen (15) to thirty (30) minutes, and less frequently as operations diminish. Progress reports will allow the dispatch center to forecast resource requests for the HazMat incident as well as everyday 911 services. Progress reports are developed as data is received from the various operational groups and from the interagency command post.

The Progress report must provide the following information to the dispatch center in a calm and organized presentation:

- location of the incident and its functioning groups and incident exposures if different from the preliminary report
- types of vehicles and/or structures currently involved
- location of the command post and its designation if changed
- location and designation of EMS command if a "transfer of command" was executed
- identification of the substance released if not previously given
- presence of any new fires, spills, or vapor leaks
- incident description and the current role of EMS
- potential for incident escalation
- number of injuries/exposures and their triage priority
- potential for further injuries
- potential for injuries to rescuers/emergency workers

- units currently operating
- additional units required
- number of patients being decontaminated, treated, and transported
- location of the staging area and best access route if a change is required

Module 2

INCIDENT ASSESSMENT AND STRATEGIC PLANNING

Section 2

ROLES AND RESPONSIBILITIES

PREHOSPITAL CARE

Field Response

Because chemicals are used extensively in our society, the potential for hazardous materials accidents exists almost everywhere. Hazardous material incidents range from relatively confined site-specific events to rapidly expanding accidents that endanger a sizable community. Regardless of its size, an incident's successful management requires pre-planning and interagency coordination.

Managing the victims of a hazardous materials incident necessitates the coordination of many resources and agencies. Roles of various agencies vary to some extent according to the county's hazardous material area plan. Generally, fire fighters and law enforcement officers are the first to arrive on scene and may obtain important information about the chemicals involved. They will designate an Incident Commander to manage incident operations at the scene. Special Hazardous Material (Hazmat) Units may be available to provide additional guidance in identifying and managing the hazardous materials and to perform decontamination of equipment, environment, victims, and personnel. Emergency Medical Services (ambulance) personnel transport the victims who have already been decontaminated (if necessary) and manage their medical problems en route to the hospital. In the event of a disaster, the county Office of Emergency Management and the local EMS agency will become involved in resource coordination. Finally, the local hospital emergency department will receive and care for the victims.

The emergency medical service prehospital providers responding to a hazardous materials incident have five goals:

Goals of Pre-Hospital Provider

- To protect themselves and other prehospital providers from any significant toxic exposure;
- To obtain accurate information on the identity and health effects of the hazardous materials and the appropriate prehospital evaluation and medical care for victims;
- To minimize continued exposure of the victim and secondary contamination of health care personnel by ensuring that proper decontamination (if necessary) has been completed prior to transport to a hospital emergency department;
- To provide appropriate prehospital emergency medical care consistent with their certification; and,
- To prevent unnecessary contamination of their transport vehicle or the hospital emergency department.

NEW JERSEY STATE POLICE
INCIDENT COMMAND SYSTEM

Although many systems exist throughout the nation for the command and control of resources at emergency incidents, the New Jersey State Police has adopted the Incident Command System (ICS) as its base for teaching the concepts of Incident Command. The ICS is recognized by the New Jersey State Police as a documented system that has been successfully used in managing available resources at emergency operations. All procedures will not perfectly fit all departments nor will the system need to be fully implemented for all situations emergency responders will encounter.

The ICS was developed as a consequence of fires that consumed large portions of wildland, including structures, in southern California in early 1970's. As a result of those fires, agencies saw the need to document a system which allowed them to work together toward a common goal in an effective and efficient manner. Firefighting Resources of California Organized for Potential Emergencies (FIRESCOPE), California State Fire Marshal's Office and the California Office of Emergency Management were the first to develop the concept of ICS.

The Federal Emergency Management Agency (FEMA) and the National Fire Academy developed a national model ICS course which has been taught on a national level. The New Jersey State Police in August of 1989 formulated a ICS Task Force to study ICS. Though originally developed for the fire services, ICS can be adapted to serve all emergency response disciplines. The system consists of procedures for controlling personnel, facilities, equipment, and communications.

ICS is designed to begin developing from the time an incident occurs until the requirement for management and operations no longer exists. The "Incident Commander" (IC) is a title which can apply equally to a trooper/police officer, or to the Superintendent/Chief of a department, depending upon the situation. The structure of the ICS can be established and expanded depending upon the changing conditions of the incident. It is staffed and operated by qualified personnel from any emergency services agency and may involve personnel from a variety of agencies. As such, the system can be utilized for any type or size of emergency and non emergency, ranging from a minor incident involving a single unit, to a major emergency involving several agencies. The ICS allows agencies to communicate using common terminology and operating procedures. It also allows for the timely combining of resources during an emergency.

New Jersey State Police
Incident Command System
(ICS)

Five Major Functions

COMMAND

Has overall responsibility at the incident or event. Sets objectives and priorities based on agency direction.

OPERATIONS

Develops the tactical organization and directs all resources to carry out the plan.

PLANNING

Develops the incident Action Plan to accomplish the objectives. Collects and evaluates information, maintains resources status.

LOGISTICS

Provide resources, and all other services needed to support the incident.

ADMINISTRATIVE/FINANCE

Monitor costs related to the incident, provide accounting, procurement, time recording and cost analyses.

EMS activities within the Incident Command System are normally designated as Triage, Treatment and Transport, although other categories such as extrication and decon may be used. Depending on training, experience and the nature of the incident, EMS personnel may fill the roles of safety or decon officer within the incident command system.

Upon arrival, you should report to the Incident Commander or designated officer. EMS personnel **MUST** follow the directions of the Incident Commander as to which areas they may not enter (the emergency medical provider, after assessing the situation, may decide to be even more cautious and stay further away). This is for the protection of all medical personnel.

Assess the situation. Determine what your escape route will be, if necessary, and from which direction potential patients will be likely to arrive. Get information to assess the risk to yourself and other responders.

DO NOT compromise your health and safety, even if it means jeopardizing the health of the patient.

RESCUE CONSIDERATIONS

Demand good, clear information while en route to the incident. If you arrive with blanks on the ***First Call Prompting Form,*** ask the Incident Commander for more information.

Often you will not be the first unit on the scene. Fire and/or police units may be the first arriving emergency personnel. Consequently, an Incident Commander may be in place when you arrive. You should **IMMEDIATELY** check in with the Incident Commander to get more information regarding what is involved, what protective measures are necessary to protect yourself, and how your services and personnel will be needed.

DON'T RUSH IN!

In some ways, a hazardous materials incident has more in common with a fire than with a standard medical run in that the rescuer is at risk every second he or she remains in the environment. The victims must be removed to a safe area very quickly, even at the sacrifice of some carrying technique. HAZMAT teams and some fire departments have equipment designed for very hostile environments and generally have far more experience at rapid and safe removal of victims from hazardous environments than medical units. The Incident Commander should direct these non-medical rescue personnel to bring victims through decon to the triage area you have established.

Remember: There is often no visual clue or odor to remind you that you are in an extremely dangerous place. There may be the possibility of an explosion, a flash fire or an extremely toxic atmosphere.

Rescue Of Overexposed Personnel

The following protocol should be followed by response personnel. Bear in mind the decision making process for victim rescue discussed in the Awareness Course.

RESCUE PROTOCOLS FOR HAZARDOUS MATERIALS ACCIDENT INCIDENTS

- Approach site with caution, determine the presence of hazardous materials.
- If chemical hazard is suspected, position personnel, vehicles, and command post at a safe distance, based on information from the DOT ERG, upwind of the site.
- Notify proper authorities and hospital. (DEP Hotline 609-292-7172).
- Put on protective gear.
- Determine the presence of injured victims.
- Assess and treat life-threatening injuries as soon as possible and when it is safe for the rescuers to enter the area.
- Move victims away from the hazard area, using proper patient transfer techniques to prevent further injury. Stay within the controlled zone if contamination is suspected.
- Victims should be monitored at the control line for possible contamination. Remove the contaminated victim's clothing, if contamination is present. Decontaminate the victim prior to transport. Remember, a patient who has been **exposed** to a hazardous material is not necessarily **contaminated.**
- Move the ambulance cot to the clean side of the control line and unfold a clean sheet or blanket over it. Place the victim on the covered cot and package for transport. Do not remove the victim from the backboard if one is used. If the victim was contaminated, a body bag with a disposable blanket may be used for transport.
- Before leaving the Hot Zone, rescuers must remove protective gear at the control line. The victim should be transported by personnel who have not entered the controlled area. Ambulance personnel attending to victims should wear gloves and other necessary personal protective equipment.
- Transport the victims to the hospital emergency department. The hospital should be given additional, appropriate information, and the ambulance crew should ask for any special instructions the hospital may have.
- Follow the hospital's protocol upon arrival.
- The ambulance and crew should not return to regular service until the crew, vehicle, and equipment have undergone monitoring and decontamination if necessary.

MEDICAL PERSONNEL SHOULD NOT PERSONALLY RESCUE VICTIMS FROM A HAZARDOUS ENVIRONMENT. Actual rescue of victims to the triage area should be performed by those with the experience and equipment for rapid, safe removal of victims, i.e. the HAZMAT Team.

EMS Safety officer

Safety Officer: A key responsibility for the Incident Commander at an incident is safety of all personnel. The ICS allows a Safety Officer to be appointed as command staff, to assist the IC. The Safety officer must advise the IC of any unsafe conditions that are present and request them to be changed through the normal chain of command. Instances of immediate danger should be corrected by the safety officer as they occur. The Safety officer has the command authority in these life endangering situations to bypass the normal incident command structure, to ensure the well being of all personnel.

The Safety officer may also require assistance to carry out the duties of the position. This officer may create safety staff who will be assigned to the various operational branches at the incident.

- **PPE utilized and appropriate**

Must ensure that the level of PPE is correct and that all rescuers are correctly utilizing it. If the required size of the PPE is not available for one of the rescuers, then this rescuer should only be in non-contaminated areas.

- **Environmental impact on rescuers**

Weather will greatly affect the perfomance of all emergency workers at the incident. Inclement weather will require modification to the standard scene construction plans. Certain types of weather may limit the magnitude of the contamination, while others may magnify the problem. The type of terrain will also affect the response and operations of the workers.

- **Personnel problems**

Problems with personnel include:

  - individuals not physically able to perform the required duties
  - pre-existing medical conditions or sicknesses
  - psychological problems such as critical incident stress
  - lack of personnel for a task
  - individuals not properly trained

- **Movement of patients**

Patient transfer should be done by non-EMS personnel if possible. These personnel will be unfamiliar with standard EMS lifting and moving techniques. Patients should always be moved as a unit with appropriate equipment such as reeves, backboards, basket stretchers, scoops and stair chairs. 4 people should be used on all carries of patients. Wheels should be used for long hauls providing the ground is smooth.

- **Universal precautions**

Universal precautions should be used when treating any patient per OSHA regulations. Some incidents may generate large amounts of body parts and fluids, such as an explosion. Standard splash protection PPE for EMS will satisfy the PPE requirements for universal precautions.

Module 2

INCIDENT ASSESSMENT AND STRATEGIC PLANNING

Section 3

BASIC HAZARD AND RISK ASSESSMENT TECHNIQUES

Hazard and Risk Assessment

Definition: The process of: detecting and identifying hazardous materials, obtaining information on the properties of a material(s) to predict and visualize a likely outcome of an incident and using this information to formulate an initial defensive action plan.

As a first responder trained to the operational level, you should keep in mind that you are trained to act in a **defensive** manner. **No offensive actions should be taken** with this level of training. While that is easy to say, it is much more difficult to do in the field. There is an inherent feeling that as an emergency responder you need to "do something" to make the situation better. This module will help you to understand the hazards and risks associated with hazardous materials and assist you in determining what defensive actions will help you "do something" without creating additional problems. You must understand that when hazardous materials are involved, doing nothing may be the best course of action you can take and the conscious decision to do nothing is really "doing something" positive.

Basic defensive actions require that you have no intentional contact with the material involved. That does not mean you cannot take any action. As long as you have no contact with the material your actions are defensive. Keep in mind the physical state of the material. Gases, dusts, mist, and vapors all present the hazard of airborne contact. You must stay upwind and uphill of the material as you work. Any action that places you in intentional contact with the material is an offensive action and should only be undertaken by people who are properly trained and equipped (haz-mat technicians and specialists).

Hazard and risk assessment consists of five basic items:

- Obtaining information on the hazardous materials, populations that might be exposed to the release, and environmentally sensitive areas.
- Recording the collected data to be able to view the possible effects.
- Determining the types of hazards present based on the information you have obtained and recorded.
- Identifying vulnerable areas presented by the situation.
- Calculating the risks associated with the situation based on the information that you have gathered.

Assessment of the Risks

The data you will collect determines the risk factors involved. Information gathered before an incident allows you to plan for future incidents and information gathered from past incidents provides valuable experience which identifies both solutions and problems associated with haz-mat response.

Minimizing the risk begins long before an incident occurs. By pre-planning at a potential site of a haz-mat incident (fixed facility or transportation) you will have knowledge of the site that is as in-depth and accurate as you make it. Attempting to develop information and a plan at the time of an incident is a time consuming process, verifying the accuracy of that information is even more time consuming.

The D.E.C.I.D.E. process is a guide to your intervention during an emergency. It is meant to minimize personal risk and in order to do so certain basic decisions must be made.

To use the process you will:

Detect the presence of hazardous materials.

Estimate the likely harm without intervention.

Choose the response objectives.

Identify the action options.

Do the best option.

Evaluate your progress.

In an emergency you must:

Detect and identify the hazardous materials present. Know the size of your problem!

Estimate the likely harm without intervention. You are in a defensive mode and want to be part of the solution not a part of the problem.

Choose objectives based on your knowledge of the problem. What is the overall goal—the harm you want to prevent? This is a most critical step.

Identify your action options, with your objectives in mind. Take the time to consider all practical options before you act. You are defining your tactics in this step.

Do the best possible option, the one with the most gain and the least loss.

Evaluate your progress to see if what you expected to happen is happening. You may have to change your actions based on your evaluation.

Remember that you are trained to take defensive actions. Basic hazard and risk assessment should be considered in both the pre-plans and the incident analysis. It is the initial safe step to hazardous materials response. The correct and as complete as possible identification of the hazardous material present will allow you to access information about the hazards and risks posed by the material. Do not come in contact with the material in attempting to identify it. Stay part of the solution not part of the problem.

USE OF THE SENSES TO DETECT THE PRESENCE OF HAZARDOUS MATERIALS

If you smell a strange odor, if you feel a strange sensation on your skin or even if you get a strange taste in your mouth, you are probably in the wrong place and should use those signs as an indication to leave.

The sense of smell is also extremely dangerous as a means of detection, as many deadly poisonous materials have little or no odor associated with their vapor. In others, the threshold (concentration of vapor in air) required to be identified is far over the level where injury will occur. It is unfortunate that many references state 'pungent' or other reference to odor in their description of the physical properties of hazardous materials. This might lead untrained and unsuspecting individuals to use odors as a primary method of detection.

In any case, do not use the sense of smell as a method of hazardous materials detection. It is an extremely dangerous practice.

The sense of hearing may be of value in detecting the escape of gas from a relief valve, or a (hopefully distant) explosion. It is generally of limited use.

The effective use of one's vision, especially when aided by binoculars and telescopes, may provide the best indication of hazardous materials presence.

Exposure control

Time

As with any other type of exposure, such as sunburn, the longer the individual is exposed to the hazardous material, the more probable it is that injury will occur. Extended exposure will also contribute to the degree of the injury. It is important to consider the time factor when organizing for a rescue and/or containment. Crews can be rotated to prevent or reduce the degree of exposure for each member to an acceptable level.

Distance

Radiological materials provide the easiest example of how remarkable the reduction in exposure is as the distance increases. With all agents however, the farther one is away from the source, the less the concentration available for exposure. Due to this, all personnel not directly involved in the operation (including spectators) should be kept at a safe distance.

Shielding

Shielding is generally thought of as a wall or possibly a lead barrier, however, in the context of hazardous materials, it also refers to the protective clothing worn by the rescuer. The clothing and equipment used must be constructed of materials that are resistant to, or not penetrated by the hazardous material.

Reference Publications

Earlier we discussed sources of information. These sources were broken down into two categories: printed and verbal. Printed reference material should be used by the first responder to identify a possible hazardous material. These publications should be readily available. The following are a list of eight publications that will assist the first responder in gathering together and verifying the identifications of a hazardous material.

- DOT Guide Book for response to Hazardous Materials Incidents.
- Emergency Action Guide Book Association of American Railroads, Bureau of Explosives.
- Emergency Handling of Haz Mat in surface transportation. Bureau of Explosives Association of American Railroads, Washington, D.C.
- Bronstein & Currance's "Emergency Care for Hazardous Materials Exposure".
- Deichmann & Gerard's "Toxicology of Drugs & Chemicals".
- Dreisbach's "The Handbook of Poisoning".
- Patty's Volume 2, "A-B-C".
- Stutz & Janusz "Hazardous Materials Injuries".

Using reference materials to ID hazardous material.

First responders should use at least three reference sources to identify the properties of a possible hazardous material. The first reason is obvious, to identify the chemical. Secondly, at least two additional reference sources should be used to cross reference its properties. This is very important to the first responder so that verification can be made and additional information can be obtained.

Reasons for using three references

- to ID chemical
- cross reference its priorities
- avoid mistakes
- get better picture of properties

There is also a vast array of telephone and computer-based information sources concerning hazardous materials. They can help you by describing the toxic effects of the chemical, its relative potency, and the potential for secondary contaminatioin and by recommending decontamination procedures. They may also provide advice on the adequacy of specific types of protective gear. Exhibit 1 is a partial listing of the many information resources available by telephone. Exhibit 2 is a list of suggested telephone numbers that should be filled in for your community. Planning is an essential part of every response, and these resources will also provide guidance that can be used in forming an effective response plan. Exhibit 3 provides a partial listing of the available computerized and on-line information sources. It should be noted that not all on-line databases are peer reviewed. Therefore, some medical management information may be based only on DOT or MSDS data. Care and planning should be used when selecting information sources.

Computerized information sources are basically two types: (a) call-up systems that are addressed via telephone lines and (b) database systems that are housed on a local computer disc. Each system contains large amounts of information on many hazardous materials and can be searched to help identify the material involved. They are updated frequently at no extra cost to the subscriber and are extremely portable with today's computer systems. Computer databases can be expensive, as can the initial cost of the equipment. Most systems will require the operator to have some knowledge of computer terms and search protocols. Also, mechanical equipment may fail and should not be counted on as a sole source of information.

Exhibit I
Telephone Information and Technical Support References

Resource	Contact	Services Provided
CHEMTREC (Chemical Transportation Emergency Center)	1-800-424-9300	24-hour emergency number. Connection with manufacturers and/or shippers who will provide advice on handling, rescue gear needed, decontamination considerations, etc. Also provides access to Chlorine Emergency Response Plan (CHLOREP).
ATSDR (Agency for Toxic Substances and Disease Registry)	1-404-639-0615	24-hour emergency number for health-related support in hazardous materials emergencies, including on-site assistance, if necessary.
Bureau of Explosives	1-202-639-2222	24-hour emergency number for hazardous materials incidents involving railroads.
Emergency Planning and Community Right-to-Know Information Hotline	1-800-535-0202	8:30 a.m.-7:30 p.m. (EST) Provides information on SARA Title III. Provides list of extremely hazardous substances and planning guidelines.
EPA (Environmental Protection Agency) Regional Offices	Region I — (617) 565-3698 CT, ME, MA, NH, RI, VT Region II — (212) 264-0504 NJ, NY, PR, VI Region III — (215) 597-0980 DC, DC, MD, PA, VA, WV Region IV — (404) 347-3454 AL, FL, GA, KY, MS, NC, SC, TN Region V — (312) 886-7579 IL, IN, MI, MN, OH, WI Region VI — (214) 655-6760 AR, LA, NM, OK, TX Region VII — (913) 236-2850 IA, KS, MO, NE Region VIII — (303) 293-1720 CO, MT, ND, SD, UT, WY Region IX — (415) 974-7460 AM SAMOA, AZ, CA, GU, HI, NV, Trust Territory of the Pacific Isl., Marshall Isl., Palau, Ponape Region X — (206) 442-2782 AK, ID, OR, WA	Environmental response team available for technical assistance.
National Animal Poison Control Center	1-217-333-3611	24-hour consultation concerning animal poisonings or chemical contamination. Provides an emergency response team to investigate incidents and perform laboratory analysis.
National Response Center	1-800-424-8802	For reporting transportation incidents where hazardous materials are responsible for death, serious injury, property damage in excess of $50,000, or continuing danger to life and property.

Exhibit II
Local Telephone Information and Technical Support Resource Worksheet

Resource	Contact (fill in for future reference)	Services Provided (fill in for future reference)
EPA Regional Office		
Regional Poison Control Center		
State Emergency Response Commission		
State Health Department		
Community Fire Department		
Community Police Department		
Local Emergency Planning Committee		
Local Health Department		
State Department of Natural Resources		

Exhibit III
Computerized Data Sources of Information and Technical Support

Data System	Contact	Description
ANSWER	ANSWER Specialized Information Svcs. National Library of Medicine Building 38A 8600 Rockville Pike Bethesda, Maryland 20894 (301) 496-6531	National Library of Medicine's Workstation for Emergency Response (ANSWER)—to advise emergency response health professionals on potential hazardous chemical emergencies.
CAMEO	CAMEO Database Manager National Oceanic and Atmospheric Administration (NOAA) Hazardous Materials Response Branch, N/OMA-34 7600 Sand Point Way, N.E. Seattle, Washington 98115 (206) 526-6317	Computer-Aided Management of Emergency Operations available to on-scene responder—Chemical identification database assists in: identifying substance involved, predicting downwind concentrations, providing response recommendations, and identifying potential hazards.
CHRIS	CIS, Inc. Fein Management Associates 7215 York Road Baltimore, Maryland 21212 (800) 247-8737	Chemical Hazard Response Information System, developed by the Coast Guard and comprised of reviews on fire hazards, fire fighting recommendations, reactivities, physicochemical properties, health hazards, use of protective clothing, and shipping information for over 1,000 chemicals.
HAZARDTEXT	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	Assists responders dealing with incidents involving hazardous materials such as spills, leaks, and fires. Emergency medical treatment and recommendations for initial hazardous response are presented.
HMIS	David W. Donaldson Information Sys. Specialist Dept. of Trans./RSPA/OHMT 400 7th Street, S.W. Washington, D.C. 20590 (202) 366-5869	Hazardous Material Information Systems provides name and emergency phone number of manufacturer, chemical formula, NIOSH number, fire fighting, spill, and leak procedures.
HSDB	Toxicology Data Network (TOXNET) National Library of Medicine Toxicology Information Program 8600 Rockville Pike Bethesda, Maryland 20894 (301) 496-6531	Hazardous Substances Data Bank, compiled by the National Library of Medicine, provides reviews on the toxicity, hazards, and regulatory status of over 4,000 frequently used chemicals.

Exhibit III (cont.)
Computerized Data Sources of Information and Technical Support

Data System	Contact	Description
1st MEDICAL RESPONSE PROTOCOLS	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	For use in developing training programs and establishing protocols for first aid or initial workplace response to a medical emergency.
MEDITEXT	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	Provides recommendations regarding the evaluation and treatment of exposure to industrial chemicals.
OHMTADS	CIS, Inc. Fein Management Associates 7215 York Road Baltimore, Maryland 21212 (800) 247-8737	Oil and Hazardous Materials Technical Assistance Data Systems provides effects of spilled chemical compounds and their hazardous characteristics and properties, assists in identifying unknown substances, and recommends procedures for handling and cleanup.
TOMES	Micromedex, Inc. 660 Bannock Street Denver, Colorado 80203-3527 (800) 525-9083	The Tomes Plus Information Systems is a series of comprehensive databases on a single CD-ROM disc. It provides information regarding hazardous properties of chemicals and medical effects from exposure. The Tomes Plus database contains Meditext, Hazardtext, HSDB, CHRIS, OHMTADS, and 1st Medical Response Protocols.
TOXNET	Toxicology Data Network (TOXNET) National Library of Medicine Toxicology Information Program 8600 Rockville Pike Bethesda, Maryland 20894 (301) 496-6531	Computerized system of three toxicologically oriented data banks operated by the National Library of Medicine—the Hazardous Substances Data Bank, the Registry of Toxic Effects of Chemical Substances, and the Chemical Carcinogenesis Research Information System. TOXNET provides information on the health effects of exposure to industrial and environmental substances.

MSDS Review

Material Safety Data Sheets (MSDS) are critical documents. Getting them or getting any information about a hazardous material that might be involved in an incident can sometimes be a problem.

Here are some possible solutions:

- Get MSDS from the responding fire company with whom the MSDS should have been filed according to SARA Title III regulations or from the company whose product is involved.
- Ask questions of any company personnel on site who may have manufacturing expertise.
- Encourage local companies to place near their entrance a lock box with their MSDS inside.
- Bring with you in the rig whatever MSDS books or hazardous materials guides you may have.

Using an MSDS

Materials Safety Data Sheets vary in format. Since there is no standard format, manufacturers can present their document information in their own way. The information you need to know, however, is always present—but you may have to hunt for it. Tip: Get MSDS from local companies and review their approach to communicating this kind of information.

In looking at an MSDS, search for:

- the product name,
- precautionary statements,
- first aid information regarding routes of exposure, exposure limits, effects of exposure (target organs),

  Look for this information under headings such as:

  "BLS/First Aid Procedures"

  "Primary Routes of Entry"

  "Emergency and First Aid Procedures"

  "Health Hazard Information"
- personal protective clothing recommended.
- Other chemical and physical characteristics such as fire, explosion and reactivity hazards.
- The name of the manufacturer or MSDS preparer, address and emergency telephone number.
- Safe handling procedures for spills or leaks.
- An indication if the material is listed with National Toxicology Program, IARC or OSHA.

A times certain information on chemical contents will be withheld from the MSDS as "trade secrets". A treating physician can obtain this information on an emergency need to know basis from the manufacturer immediately. The physician will be required to follow-up with a written request and sign a non-disclosure agreement.

Enclosed are **sections** from Materials Safety Data Sheets for your review. For each material, please discuss:

- What should be your basic response to an incident involving this material?
- What EMS protective clothing would be needed?
- What equipment would be needed?
- What disposal equipment could we use?*
- What equipment could we commit that could be decontaminated later?

*Tip: Practice working with both surgical gloves and latex gloves on. Test what EMT duties you can and cannot perform when wearing this protective combination.

MSDS NO. 1218-04
CAS NO. ----------
DATE: 10/03/86

PRODUCT IDENTIFICATION

TRADE NAME:	**ACCURAC® 135 RETENTION AID**
SYNONYMS:	Cationic polyacrylamide in water-in-oil emulsion
CHEMICAL FAMILY:	Cationic polyacrylamide
MOLECULAR FORMULA:	Mixture
MOLECULAR WGT.:	Mixture

WARNING

DANGER! CAUSES SKIN BURNS
HARMFUL IF INHALED
MAY CAUSE EYE IRRITATION

HAZARDOUS INGREDIENTS

COMPONENT	CAS. NO.	%	TWA/CEILING	REFERENCE
Petroleum distillate	008002-05-9	26.5	500 ppm	OSHA

NFPA HAZARD RATING

Fire 1
Health 2 0 Reactivity
Special

FIRE: Material that must be preheated before ignition can occur.
HEALTH: Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
REACTIVITY: Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.

HEALTH HAZARD INFORMATION

EFFECTS OF OVEREXPOSURE:	The acute oral (rat) and acute dermal (rabbit) LD50 values are both > 10 ml/kg. Minimal eye irritation was produced during primary irritation testing in rabbits. When this product was tested for skin irritation under occlusive conditions, as would occur if the product was spilled into boots, irreversible skin damage was produced. However, when this product was tested under open conditions as would occur if the product was spilled on clothing, only mild skin irritation was produced after 24 hours of contact. Aspiration of the solvent, petroleum distillate, may cause chemical pneumonitis. Overexposure to vapor of petroleum distillates may cause dizziness, headache, nausea, and irritation of the respiratory tract.
FIRST AID:	In case of skin contact, remove contaminated clothing without delay. Wear impervious gloves. Cleanse skin thoroughly with soap and water. Do not omit cleaning hair or under fingernails if contaminated. Do not reuse clothing without laundering. Do not reuse contaminated leatherware. In case of eye contact, immediately irrigate with plenty of water for 15 minutes.

PRODUCT NAME: Glutaraldehyde (25% by weight)

III. INGREDIENTS

MATERIAL	%	TLV (Units)	HAZARD
Glutaraldehyde CAS # 111-30-8	25	See Section V	See Section V
Water CAS # 7732-18-5	~75	None established	See Section V
Methanol CAS # 67-56-1	< 0.05	See Section V	See Section V

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method(s)):	None, Tag Closed Cup ASTM D 56 None, Cleveland Open Cup ASTM D 92
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Not determined (aqueous syster UPPER: Not determined (aqueous systen
EXTINGUISHING MEDIA:	Non-Flammable (Aqueous System): After the water evaporates, the remaining material will burn. Use alcohol-type or all-purpose-type foam applied by manufacturer's recommended technique for large fires. Use CO_2 or dry chemical media for small fires.
SPECIAL FIRE FIGHTING PROCEDURES:	Use self-contained breathing apparatus and protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	None

PRODUCT NAME: Glutaraldehyde (25% by weight)

V. HEALTH HAZARD DATA

TLV AND SOURCE: Glutaraldehyde - 0.2 ppmv, ceiling OSHA & ACGIH 1988-89
Methanol - 200 ppm, skin OSHA & ACGIH 1988-89

EFFECTS OF SINGLE OVEREXPOSURE:

SWALLOWING:	Moderately toxic. May cause moderate to marked irritation or chemical burns of the mouth, throat, esophagus, and stomach. There will be discomfort or pain in the chest and abdomen, nausea, vomiting, diarrhea, dizziness, faintness, drowsiness, weakness, circulatory shock, collapse and coma.
SKIN ABSORPTION:	Toxicology studies indicate that prolonged or widespread contact could result in the absorption of potentially harmful amounts of material.
INHALATION:	Vapor is irritating and will cause stinging sensations in the nose and throat, coughing, chest discomfort and tightness, difficulty with breathing, and headache.
SKIN CONTACT:	Brief contact may result in mild to moderate local redness and possibly swelling. Prolonged contact may result in severe inflammation.
EYE CONTACT:	Liquid will cause severe conjunctivitis, seen as discharge with marked swelling and excess redness of the conjunctiva. Severe corneal injury may occur. Vapor will cause stinging sensations with excess lachrymation, but not injury.

EFFECTS OF REPEATED OVEREXPOSURE:
None known from currently available information.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:
Because of its irritating properties, this material may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: Laboratory studies have shown that glutaraldehyde is not teratogenic, and several studies have shown the material not to be a mutagen.

OTHER EFFECTS OF OVEREXPOSURE:
May cause skin sensitization in a small proportion of individuals, and present as an allergic contact dermatitis.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING:	Give at least two glasses of water. Do not induce vomiting. Seek medical assistance with urgency.
SKIN:	Wash contaminated skin with soap and water. If contact has been widespread and prolonged, or if irritation persists, seek medical advice. Contaminated clothing should be washed before reuse.
INHALATION:	Remove to fresh air. If breathing is difficult, administer oxygen. If symptoms persist, call a physician.
EYES:	Immediately flush eyes thoroughly with water and continue flushing for at least 15 minutes. See an ophthalmologist urgently.

NOTES TO PHYSICIAN: Aspiration may cause lung damage. Probable mucosal damage may contraindicate the use of gastric lavage; however, if gastric lavage is considered necessary, it should be undertaken with caution. Most of the adverse effects of glutaraldehyde are due to its intensely irritating properties. Because of this vomiting should not be induced in cases of poisoning by swallowing. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

DANGER: CORROSIVE
CAUSES IRREVERSIBLE EYE DAMAGE.
CAUSES SKIN IRRITATION
HARMFUL IF INHALED.
HARMFUL IF SWALLOWED.
HARMFUL IF ABSORBED THROUGH SKIN.
MAY CAUSE SKIN SENSITIZATION.
Do not get in eyes, on skin, on clothing.
Avoid breathing vapor.
Do not swallow.
Wear goggles, protective clothing, and rubber gloves.
Wash thoroughly with soap and water after handling.
Remove contaminated clothing and wash before reuse.
FOR INDUSTRY USE ONLY

OTHER PRECAUTIONS: Laboratory studies, using an odor test panel, indicated glutaraldehyde vapors in air may be 'irritating' to humans at about 0.3 ppm in air; the TLV has been established as 0.2 ppm ceiling. Thus, if vapors are concentrated enough to be irritating, the TLV is probably being exceeded.

SECTION I PRODUCT IDENTIFICATION & EMERGENCY INFORMATION

PRODUCT NAME

ECA 10454

CHEMICAL FAMILY

Lube oil additive containing a zinc salt of dialkyl dithiophosphoric acid, borated polyisobutenyl succinic anhydride nitrogen functionalized dispersant, magnesium alkylaryl detergent, solvent extracted mineral oil, and other components judged not to affect the potential health or environmental impact of the product.

EMERGENCY TELEPHONE NUMBERS:

CHEMTREC 800-424-9300

SECTION II HAZARDOUS COMPONENTS OF MIXTURES

THE PRECISE COMPOSITION OF THIS MIXTURE IS PROPRIETARY INFORMATION. A MORE COMPLETE DISCLOSURE WILL BE PROVIDED TO A PHYSICIAN OR NURSE IN THE EVENT OF A MEDICAL EMERGENCY. THE FOLLOWING COMPONENTS ARE DEFINED HAZARDOUS IN ACCORDANCE WITH 29CFR1910.1200:

OSHA HAZARD	COMPONENT
Eye irritant	Zinc salt of dialkyl dithiophosphoric acid

For additional information see Section X.

SECTION III HEALTH INFORMATION AND PROTECTION

FIRST AID & NATURE OF HAZARD

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.
Irritating, and may injure eye tissue if not removed promptly.

SKIN CONTACT:

Flush with large amounts of water; use soap if available.
Remove grossly contaminated clothing, including shoes, and launder before reuse.
Low order of toxicity.
Frequent or prolonged contact may irritate.

INHALATION:

Using proper respiratory protection, immediately remove the affected victim from exposure. Administer artificial respiration if breathing is stopped. Keep at rest. Call for prompt medical attention.
Negligible hazard at ambient (-18 to 38 Deg C) or recommended blending temperature.
Warning if heated above 60 Deg. C (140 Deg. F) especially in the presence water, hydrogen sulfide may be released; this can cause respiratory collapse, coma and death without necessarily any warning odor being sensed
Avoid breathing vapors or mists.

INGESTION:

DO NOT induce vomiting. If individual is conscious, give milk or water to dilute stomach contents. Keep warm and quiet. Get prompt medical attention. DO NOT attempt to give anything by mouth to an unconscious person.
Minimal toxicity.

Factors Effecting the Behavior of Hazardous Material

There are four basic factors that affect the behavior of hazardous materials at an emergency.

- The inherent properties and quantity of the material involved including:

  Physical state (solid, liquid, or gas).

  Reactivity.

  Flammability.

  Health Hazards.

- The built-in characteristics of the container including the five basic forms of stress to the container. Those forms of stress are:

  "Thermal stress" caused by fire, sparks, friction, electricity, ambient temperatures, and extreme or intense cold.

  "Mechanical stress" caused by an object physically contacting the container and the effects caused such as punctures, gouges, bending, breaks, or tears.

  "Chemical stress" caused by chemical actions such as acids corroding the container, pressure generated by decomposition, polymerization, or corrosion.

  While less common, "Irradiation" and "Etiologic stresses" can occur and allow the release of the material.

  Container can be stressed in one or more ways as occurred in Waverly, Tenn. when a train derailed, caught fire, was extinguished. Two days later as a propane car was being moved, a mechanical BLEVE occurred. They had both thermal and mechanical stress applied to it.

- The natural laws of physics and chemistry will affect the incident based on the material and forces present.

- The environment including the exposures, physical surrounding (terrain), and the conditions (weather) will all affect the incident.

Defensive and Offensive Action

Defensive

The act or actions taking during a hazardous material emergency/incident in which there is **no intentional contact** with the material involved.

It involves, but is not limited to:

- care and transport of a clean decontaminated patient
- performing patient or responder decon after proper training
- caring for injured victims during decon after proper training
- elimination of ignition sources
- vapor suppression
- and diking or diverting to keep a release to a confined area

It requires notification and possible evacuation, but *does* not involve entering the hot zone, plugging, patching or cleanup of spilled or leaking materials.

Offensive

The action or actions taken by a hazardous materials technician/specialist, in appropriate chemical protective clothing, to handle an emergency/incident which may result in contact with the released material.

This involves but is not limited to: rescuing victims from a contaminated area, patching or plugging to slow or stop a leak, containing of a material in its own container or package, and cleanup operations which may or may not require overpacking or transfer of a product to another container.

WATCH OUT FOR YOURSELF AND EVERYONE ELSE!

NOTE: Your emergency vehicle can be an ignition source:

- Hot exhaust system.
- Vehicle's electrical/ignition system.
- Rotating lights/strobes.
- Most of the electrical/equipment switches.
- Radios/sirens/PA systems.
- Cab, box and compartment lighting.
- Electrical clocks.
- Work and marker lights.

What other ignition sources may you possibly need to be concerned with?

- Other vehicles getting too close or positioned incorrectly.
- Flares.
- Cigarettes, pipes, cigars, lighters, matches, etc.
- Flashlights (including penlights) that are not intrinsically safe.
- Portable radios that are not intrinsically safe.
- Pagers that are not intrinsically safe.
- Telemetry equipment that is not intrinsically safe.
- Bullhorns or portable PA systems.
- Electrical or gas powered rescue tools.
- Use of striking tools causing sparks.
- Static electricity sparks *(nylon jackets act like batteries for static electricity).*
- Firearms.
- Battery operated hearing aids, watches, etc.
- Defibrillators.

Module 2

INCIDENT ASSESSMENT AND STRATEGIC PLANNING

Section 4

INFORMATION MANAGEMENT

RECORD KEEPING
ALARM PHASE

Reporting

The type of response that your department makes to a hazardous materials incident will be based on the information that you are able to obtain. See figure A-1.

There are several methods through which the Municipality, the County, or the New Jersey Department of Environmental Protection and Energy (NJDEPE), may be advised of incidents involving the release or potential for release of hazardous substance pursuant to the Spill Compensation and Control Act (N.J.S.A. 58:10-23, 11, et seq.) and Emergency Notification Act (N.J.S.A. 13:1K-17) A310.

FIGURE A-1.

1. _____ **HAZ MAT INITIAL CONTACT MESSAGE FORM** _____
   PRESENT TIME PRESENT DATE
2. PERSON CALLING: _____ PHONE: (____)_____
   FROM:_____ TIME THEY RECEIVED CALL: _____
   _____ FROM NJDEP TRENTON DISPATCH NJDEP T.D. CASE #: _____
3. INCIDENT LOCATION:_____
   REPORTED BY/FROM:_____PHONE: (____) _____
   ADDRESS: _____CITY:_____COUNTY: _____
4. DATE/TIME OF EVENT: _____ /_____
5. MATERIALS INVOLVED: _____ PLACARD ID #'s: _____
   _____ _____
   STATE OF MATERIALS:___GAS___LIQUID___SOLID
   AMOUNTS INVOLVED:_____ACTUAL ___POTENTIAL ___ESTIMATED
   _____ MATERIALS CONTAINED: (Y/N/U):_____
6. INCIDENT DESCRIPTION:___FACILITY___ROAD___ RAIL ___SHIP___OTHER:_____
   INJURIES (Y/N/U):___NUMBER:_____ PUBLIC EXPOSURE (Y/N/U):_____
   FACILITY EVACUATION (Y/N/U):___NUMBER:_____ POLICE AT SCENE (Y/N/U):_____
   PUBLIC EVACUATION (Y/N/U):___ NUMBER:_____FIREMEN AT SCENE (Y/N/U):_____
   CONTAMINATION MODE:___AIR___ LAND___WATER_____WIND FROM/SPEED:_____ /_____
   WATERWAYS AFFECTED:_____ PRECIPITATION:___ RAIN ___SNOW___NONE
   LOCATION TYPE: ___ RESIDENTIAL ___ INDUSTRIAL ___ RURAL
   SENSITIVE POPULATION:___HOSPITAL ___ SCHOOL ___ NURSING HOME ___OTHER: _____
7. STATUS AT SCENE: _____
   _____
   _____
   _____
8. RESPONSIBLE PARTY: (___ Same as INCIDENT LOCATION—Item #3)___UNKNOWN
   COMPANY:_____CONTACT: _____ PHONE: (____) _____
   ADDRESS:_____CITY:_____STATE: _____
9. AGENCIES & PERSONS CONTACTED (SPECIFY REFERRAL/ENROUTE/AT SCENE):
   _____ TIME:_____ PHONE: (____) _____
   _____ TIME:_____ PHONE: (____) _____
   _____ TIME:_____PHONE: (____) _____
   _____TIME:_____ PHONE: (____)_____
   _____ TIME:_____PHONE: (____)_____
10. ADDITIONAL NOTES: _____
    _____
    _____
    _____
11. REPORT FILED BY: _____ HAZMAT ICMF-1 5/21/87

Module 3

MEDICAL OPERATIONS AND TACTICS

Module 3

MEDICAL OPERATIONS AND TACTICS

Objectives:

Upon completion of this course the student will be able to:

1. MEDICAL MONITORING

- Explain procedures for onsite medical monitoring of the HazMat entry team.

2. OVEREXPOSURE AND/OR INJURY

- Name 4 ways to be exposed to hazmat.
- List 3 factors which control exposure and dose of a hazardous material.
- List 4 routes of entry of HazMat into the body.
- List 10 common signs and symptoms of over exposure.

3. DECONTAMINATION

- Define definitive and gross decontamination.
- Explain basic decontamination procedures for most incidents.

4. PATIENT CARE

- Explain patient triage consideration at a HazMat scene.
- Explain the S.T.A.R.T. system of triage.
- Explain patient treatment procedures at a HazMat scene.

5. TRANSPORT

- List at least 5 pieces of information which must be relayed to the ED.
- List 2 procedures which would reduce exposure potential to the EMS responder.
- List 2 reasons why Aeromedical transport is not routinely used at HazMat incidents.

6. REHABILITATION

- List 2 reasons to have rehab services at the HazMat incident.
- List the three responsibilities of the Rehab group.
- List 3 standards of a rehabilitation site.

7. POST INCIDENT

- List 3 post event considerations for the EMS responder.

Module 3

MEDICAL OPERATIONS AND TACTICS

Section 1

MEDICAL MONITORING

Guidelines for
Medical Monitoring of Entry Personnel

- Haz Mat Checklist—Medical Group
- Medical Monitoring and Treatment Report
- New Jersey State Police Incident/Exposure Report
- OEM Medical Surveillance Report

To define medical monitoring procedures for entry personnel.

All entry personnel in Level A or Level B protection shall comply with the medical monitoring procedures as detailed.

The exclusion criteria will vary from team to team. Each Haz-Mat response unit will pre-establish medical parameters for entry or re-entry into PPE. In addition, specific criteria will also require medical treatment and transport to the hospital.

SPECIAL NOTE: When a response team exceeds their safety parameters the EMS specialist should immediately inform the Haz-Mat Team Safety Officer for further action. The Haz-Mat Team Safety Officer and Haz-Mat team manager will determine if and when the responder can return to operations.

The following is an EXAMPLE of pre-entry exclusion criteria.

Prior to donning protective gear, personnel to be monitored will have the following physical assessment and hydration performed by the EMS Specialist or designee.

- Vital Signs: Temperature, respiratory rate, pulse and blood pressure.

  Entry will be denied to personnel with an oral temperature of greater than 99.6°F, pulse greater than 110 or irregular without prior history, respiratory rate greater than 24, or blood pressure greater than 150/90.

  Personnel exhibiting an irregular pulse with no prior history must have a rhythm strip obtained.

- Body weight.
- Assess cognitive skills.

  Personnel shall count backwards from 100 by sevens.

- Hydrate.

  Personnel shall consume 16 ounces of cold water or diluted (4:1) electrolyte solution.

During the time in protective gear the entry personnel shall be monitored by the EMS Specialist or designee.

- Observed changes in gait, speech, or behavior requires "entry" person to undergo immediate decontamination, undressing, and assessment.

- Complaints of chest pain, dizziness, shortness of breath, weakness, or headache requires personnel to undergo immediate decontamination, undressing, and assessment.

- The time on SCBA and in protective gear will be monitored to ensure at least a fifteen (15) minute reserve air supply to undergo decontamination. Working time allowed on SCBA and in protective gear varies with the ambient temperature and humidity (humiture).

After decontamination and removal of protective gear, monitored personnel will have the following physical assessment and hydration performed by the EMS Specialist.

- Vital Signs: temperature, respiratory rate, pulse, blood pressure.

  If a respiratory rate, pulse or blood pressure exceed 10% of the pre-exposure values, personnel shall be kept at rest and reassessed every ten (10) minutes until return to normal and acceptable limits.

  If temperature is greater than 100°F, keep in a cool environment, apply cool, moist towels to trunk, head, neck, underarms, and groin areas. Establish medical control to determine if transport to medical facility is necessary.

- Weight:

  If weight loss is less than 5%, and no signs of heat illness or dehydration, administer cool fluids by mouth (P.O.) in eight-ounce increments until satiation occurs.

  If weight loss is greater than 5%, or signs of dehydration are apparent, administer oxygen 50-100%, establish IV of Lactated Ringers solution KVO and titrate to a systolic blood pressure of 100 mmHg and as directed by the consulting physician. Avoid P.O. fluids if the patient is nauseous.

- Reassess cognitive skills.

- Further assessment of heart, lungs, mentation, and muscle tone will be performed as indicated by the toxicity of substances and exposure.

FOR FURTHER INFORMATION
REFER TO MODULE 3, SECTION 6
REHABILITATION

HAZARDOUS MATERIALS RESPONSE
MEDICAL MONITORING AND TREATMENT REPORT

NAME: _____ REPORT #: _____

AGE: _____ SEX: _____ TRIAGE #: _____

AGENCY: _____ DATE: _____

INCIDENT HISTORY, INCLUDING POTENTIAL/CONFIRMED AGENT(S) OF EXPOSURE:

MSDS ATTACHED? YES ☐ NO ☐Specify:

CURRENT MEDICAL HISTORY:

Current or Recent Ailments: Colds, Flu, Infections, Open Wounds, Rashes, Etc.

Current Medications: (Include Over-the-Counter)

LOCATION AND CONTACT FOR MEDICAL RECORDS:

VITAL SIGNS, WEIGHT, AND COGNITIVE TEST LOG

TIME	ENTRY /EXIT	TEMP	PULSE	RESP	BLD/PRES	LEAD 2 ECG	WGT	TEST

HYDRATION LOG

TIME	ENTRY /EXIT	AMOUNT (cc)	FLUID DESCRIPTION	NOTES:

Signature: _____ Title: _____ Agency: _____

SIGNS & SYMPTOMS OF EXPOSURE

Reference Sources: 1) _____

2) _____

3) _____

CHEMCIAL #1: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #2: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #3: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #4: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #5: _____

Signs/Symptoms: _____

_____

_____

HAZARDOUS MATERIALS RESPONSE

MEDICAL MONITORING AND TREATMENT REPORT

NAME: _____ REPORT #: _____

CHIEF COMPLAINT:

SIGNS **SYMPTOMS**

CNS/Senses:

Head/Neck/Back:

Chest/Abdomen:

Extremities:

VITAL SIGNS

TIME	TEMP	PULSE	RESP	BLD/PRES	LEAD 2 ECG	WGT	TEST P/F

TREATMENT RECORD

TIME	TEMP	PULSE	RESP	BLD/PRES	LEAD 2 ECG	TREATMENT

TREATMENT NARRATIVE

TRANSPORTED TO: BY: TIME:

ADMIT DIAGNOSIS: **DISCHARGE DIAGNOSIS:**

Signature: _____ Title: _____ Agency: _____

Distribution: White—Hospital/Yellow—Medical Director/Pink—EMS Agency

Attach to Standard Ambulance Report

Page 2 of 2

NEW JERSEY STATE POLICE INCIDENT/EXPOSURE REPORT

☐ INCIDENT ☐ EXPOSURE

Station/Unit	Code	Phone No. and Ext.	Division Case Number	Other Report Numbers

ı of Incident/Exposure	Time A.M. ☐ P.M. ☐	Location of Incident (Bldg/Street/Highway)

Municipality	Mun. Code	County	Exact Product Spelling (List additional products in narrative)

Materials I.D. Number	Response Guide Number	Time Arrived at Scene ☐ A.M. ☐ P.M.	Time Departed from Scene ☐ A.M. ☐ P.M.

Narrative: (Include: type of incident, cause of incident/spill, known hazardous materials, your activity at scene, exposure symptoms, vehicle transporting product - make/year, reg./state, owner/address, etc.)

Agencies at Scene	State Police Personnel at Scene	Badge No.

Continue Additional Information on Plain Bond Paper

Rank/Name/Badge No. (Print or Type)	Page	Date	Reviewed By:
_____ Signature	____ of ____		

White Copy: C.J.R.B. Yellow Copy: Hazardous Materials Emergency Response Planning Unit Pink Copy: Station/Unit Gold Copy: Medical Unit

S.P. 81 (Rev. 7-88) S.O.P. J8

INFORMATION SHEET #2.1

Medical Monitoring Leader—Position Description

CHAPTER 1—CHECKLIST

1.1 CHECKLIST USE: The checklist presented below should be considered as a minimum requirement for this position. Users of this manual should feel free to augment this list as necessary.

1.2 MEDICAL MONITORING LEADER CHECKLIST

- Check in and obtain briefing from the Assistant Safety Officer Hazardous Materials.
- Obtain briefing from HazMat Group Supervisor.
- Obtain needed equipment from the HazMat Unit.
- Obtain chemical and medical information from the Technical Specialist—Hazard Materials Reference.
- Obtain baseline medical information from team members.
- Brief on-site EMS crews.
- Assist Decontamination Unit Leader in transfer of patients to the Medical Group/ Unit.
- Maintain communication and coordinate operations with the Entry Leader.
- Maintain communication and coordinate operations with the Assistant Safety Officer—Hazardous Materials.
- Maintain Unit Log (ICS Form 214)

CHAPTER 2—ORGANIZATION, PERSONNEL, RESPONSIBILITIES AND PROCEDURES

2.1 ORGANIZATION: The Medical Monitoring Leader reports to the Assistant Safety Officer—Hazardous Materials. The Medical Monitoring Leader is responsible for implementing medical monitoring for all personnel operating in the Exclusion Zone and the Contamination Reduction Zone. The Medical Montoring Leader may assist the Medical Unit Leader in providing medical care to Entry Team members and Decontamination Team members who have been exposed to hazardous materials or who are suffering from heat related illnesses. The Medical Monitoring Leader, using objective criteria, will determine the fitness of the Entry Team or Decontamination Team, members to conduct operations.

2.2 PERSONNEL: The Medical Monitoring Leader is part of the organizational structure designed to provide the Assistant Safety Officer—Hazardous Materials with the expertise to evaluate and monitor the medical condition of all emergency response personnel who may be required to use Personal Protective Equipment (PPE). Personnel in this position must be able to perform team member physical assessments, according to the guidelines presented in this policy. The Medical Monitoring Leader shall follow the established pre-entry Medical policy for determining whether team members are authorized for entry operations. The Medical Monitoring Leader must be able to recognize the signs and symptoms of heat disorders, hazardous materials exposures, and other medical emergencies. These responsibilities require that the personnel assigned to this position be *minimally* certified to the Emergency Medical Technician—1 level.

2.3 RESPONSIBILITIES: The purpose of the On-Site Medical Monitoring Program is to ensure the safety of emergency response personnel. Emergency response personnel are exposed to high levels of physiological and psychological stress. Personnel may develop heat stress while wearing Personal Protective Equipment (PPE) or while working during temperature extremes. Team members may also be exposed to hazardous substances. The On-Site Medical Monitoring Program uses objective criteria to monitor the physical health of all members of the Entry Team, Back Up Team, Decontamination Team, and other assigned support personnel.

A Medical Monitoring Leader shall be appointed if *any* personnel will be using PPE. The person assigned to this position shall be trained in the On-Site Medical Monitoring Program. Depending on the number of personnel donning PPE it may be necessary to assign additional personnel to the Medical Monitoring Team.

The Medical Monitoring Leader shall acquire the following equipment:

- Stethoscope(s)
- Blood Pressure Cuff(s)
- Oral or Tympanic, Basal Thermometer
- Weigh Scale
- Medical Monitoring Leader Checklist
- Medical Monitoring Forms

2.4 STANDARD OPERATING PROCEDURES—ON-SITE MEDICAL MONITORING

Pre-Entry

Pre-entry vital signs and weights shall be taken prior to performing any strenuous activity or donning any chemical protective equipment. Baseline vital signs should include:

- Blood Pressure
- Pulse
- Respirations
- Weight
- Temperature

The Medical Monitor shall calculate the following values for each Team member:

- Maximum Heart Rate (220 – Age)
- 85% of Maximum Heart Rate
- 60% of Maximum Heart Rate
- 5% Body Weight
- 3% Body Weight

All information shall be entered on the medical monitoring forms.

Any team member with any of the following conditions shall not be allowed to don PPE.

Temperature	>99.8 degrees F,
Blood Pressure	>150/90,
Heart Rate	>60% of Maximum Heart Rate, or
Respirations	>25

The Medical Monitoring Leader shall obtain Hazard and Toxicity information from the Technical Specialist—Hazardous Materials Reference. Also, signs and symptoms of chemical exposure shall be ascertained if the chemical is known. The Medical Monitoring Leader shall reference the Cal-EMSA treatment guidelines for pre-hospital treatments for known environments and potential exposure complications.

The Medical Monitoring Leader shall brief on-site EMS crews. The following information, if known, shall be conveyed:

- Chemical Name
- Hazard Class and Name
- Hazard and Toxicity Information
- Potential for Secondary Contamination

- Pre-hospital Management after Initial Decontamination
- Procedure for Transfer of Patients to EMS
- Pre-hospital Management of Medical Emergencies

Post-Entry Procedures

After team members doff PPE they shall immediately proceed to the medical monitoring station. The medical monitors will obtain the following:

- Pulse—first minute
- Pulse—3 minutes after first pulse (recovery rate)
- Temperature
- Weight
- Blood Pressure
- Respirations

Determinations will then be made for capabilities to perform further entry operations.

If any one of the following criteria are met the team member shall not be allowed to perform duties requiring the use of PPE for 24 Hours:

Pulse	>85% of Maximum Heart Rate
Temperature	>100.4 degrees F
Recovery Heart Rate	<10 BPM (initial pulse—3 Min. pulse)
Blood Pressure	>160/100
Weight Loss	≥3%

The Medical Monitoring Leader shall immediately report the name of any team members meeting the above criteria to the Assistant Safety Officer—Hazardous Materials and the Entry or Decontamination Leader as appropriate.

No team member shall be allowed to re-don PPE if they cannot meet the pre-entry requirements previously described.

Any team member exhibiting signs or symptoms of heat exhaustion, or heat stroke, or who has had a weight loss ≥5% shall be transported by Advanced Life Support Ambulance to the hospital for evaluation. Intravenous fluid resuscitation may be required for these personnel.

Any team member who is exposed to hazardous materials shall be assessed by Advanced Life Support personnel for signs and symptoms of exposure at toxic levels. Any person exhibiting signs and symptoms of exposure shall be transported to a hospital emergency department by ALS ambulance according to local medical guidelines. If the individual is not exhibiting any signs and symptoms of a hazardous material exposure, the individual may still be required to be evaluated at a hospital emergency department if, in the opinion

of the Asst. Safety Officer Hazardous Materials and/or the Environmental Health Specialist, such evaluation is necessary based on the properties of the hazardous material. The Medical Monitoring Leader shall immediately notify the Hazardous Materials Group Supervisor and the Assistant Safety Officer—Hazardous Materials of any team member who needs transport to the hospital. Transportation shall be arranged through the Medical Unit Leader, or appropriate supervisor. Unless the team members condition is emergent, the on-site ambulance should not be used as this would require shutting down any further operations in the Exclusion Zone.

While at the medical monitoring station, Team members should drink at least 16 fluid ounces of water or other suitable substance for rehydration (Gatorade, Powerburst). Team members should be encouraged to drink more than this if they still feel thirsty. Soda, or other liquids containing caffeine, carbonation, or alcohol will not be allowed. Remember, thirst is not an adequate indicator of heat exposure. Consult fluid resuscitation charts when appropriate.

After all operations are terminated, the Medical Monitoring Leader shall collect all Medical Monitoring Forms and give them to the Documentation Unit Leader or Hazardous Material Group Supervisor. This shall include documentation for all cost recoverable items. All recoverable equipment used by the Medical Monitoring Team should be cleaned and returned to the Haz Mat Unit(s). All waste materials shall be disposed of by the appropriate method(s).

INFORMATION SHEET #2.2

Medical Monitoring Worksheet

Name	Age	Pre-Entry					Post-Entry					Critical Values*				
		Pulse	Temp	Wgt	BP	Resp	Pulse	Temp	Wgt	Resp	Pulse 3 Min	MHR	85% MHR	60% MHR	3% Wgt	5% Wgt

Prepared by: Name: Position: Agency:

Key BP = Blood Pressure Wgt = Weight MHR = Maximum Heart Rtae (220 – Age)

*See chart on back for these values.

Critical Values for the Medical Monitoring Worksheet

Weight	3% Loss	5% Loss	Age	MHR	85% MHR	60% MHR
130	126	124	20	200	170	120
135	131	128	21	199	169	119
140	136	133	22	198	168	119
145	141	138	23	197	167	118
150	146	143	24	196	167	118
155	150	147	25	195	166	117
160	155	152	26	194	165	116
165	160	157	27	193	164	116
170	165	162	28	192	163	115
175	170	166	29	191	162	115
180	175	171	30	190	162	114
185	179	176	31	189	161	113
190	184	181	32	188	160	113
195	189	185	33	187	159	112
200	194	190	34	186	158	112
205	199	195	35	185	157	111
210	204	200	36	184	156	110
215	209	204	37	183	156	110
220	213	209	38	182	155	109
225	218	214	39	181	154	109
230	223	219	40	180	153	108
235	228	223	41	179	152	107
240	233	228	42	178	151	107
245	238	233	43	177	150	106
250	243	238	44	176	150	106
255	247	242	45	175	149	105
260	252	247	46	174	148	104
265	257	252	47	173	147	104
270	262	257	48	172	146	103
275	267	261	49	171	145	103
280	272	266	50	170	145	102
285	276	271	51	169	144	101
290	281	276	52	168	143	101
295	286	280	53	167	142	100
300	291	285	54	166	141	100

Age vs. Heart Rate

Age	Max rate	85% of max	60% of max
18	202	172	121
20	200	170	120
22	198	168	119
24	196	167	118
26	194	165	116
28	192	163	115
30	190	162	114
32	188	160	113
34	186	158	112
36	184	156	110
38	182	155	109
40	180	153	108
42	178	151	107
44	176	150	106
46	174	148	104
48	172	146	103
50	170	145	102
52	168	143	101
54	166	141	100
56	164	139	98
58	162	138	97
60	160	136	96

_____ County HazMat Team

Incident Location _____ **Date:** _____

Incident Command Officer: _____ **Agency** _____

Medical Officer: _____ **Agency** _____

Safety Officer: _____ **Agency** _____

Hazardous Materials Involved:

_____

Entry: (Circle One) Initial, Back up, Decon

HAZMAT MEDICAL TEAM CHECK

NAME _____ CHECKED BY _____

LEVEL OF ENTRY _____ MODIFICATIONS _____
S.C.B.A. _____ Type Gloves Worn _____

Initial Vitals:
Time Taken _____

Entry Time: _____
Time on Air: _____

PULSE: _____ WEIGHT: _____
BLOOD PRESSURE: _____ LUNG SOUNDS: _____
RESPIRATION: _____ PREHYDRATION: _____
TEMPERATURE: _____ MED. HISTORY: _____
PULSE OXIMETER: _____
E.K.G.: (if applicable) _____

POST ENTRY VITALS
Time Taken _____

EXIT Time: _____
Time off Air: _____

PULSE: _____ WEIGHT: _____
BLOOD PRESSURE: _____ LUNG SOUNDS: _____
RESPIRATION: _____ POSTHYDRATION: _____
TEMPERATURE: _____ **Total Exposure Time**
PULSE OXIMETER: _____ Initial Entry: _____ Min.
E.K.G.: _____ Secondary Entry: _____ Min.

_____ County HazMat Team

MEDICAL HISTORY_____ NAME _____

A. Current Medications
   1. _____
   2. _____
   3. _____

B. Known Allergies Drug & Environmental; (Food)
   1. _____
   2. _____
   3. _____

C. Cardio Respiratory Symptoms
   1. Cough yes _____ no _____
   2. Sore Throat yes _____ no _____
   3. Chest Pain yes _____ no _____
   4. Short of Breath yes _____ no _____
   5. Nasal Symptoms yes _____ no _____

D. Abdominal Symptoms
   1. Nausea/Vomiting yes _____ no _____
   2. Pain yes _____ no _____
   3. Diarrhea yes _____ no _____

E. Skin Problems
   1. Rash yes _____ no _____
   2. Sores yes _____ no _____
   3. Wounds/Cuts yes _____ no _____

F. CNS Symptoms
   1. Headache yes _____ no _____
   2. Dizzy yes _____ no _____
   3. Weak yes _____ no _____

COMMENTS:

_____

_____

_____

_____

Examiner _____

Module 3

MEDICAL OPERATIONS AND TACTICS

Section 2

OVEREXPOSURE AND/OR INJURY

Exposure—Dose

Exposure is the act of coming into contact with a contaminant.

Dose is the amount of contaminant taken into the body.

SIX WAYS TO BE EXPOSED TO HAZARDOUS MATERIALS

Thermal

- high or low temperature extremes

Radiation

- energy released from radioactive sources

Asphyxiation

- many materials have the ability to interfere with the respiratory process

Chemical

- the body is affected through chemical mechanisms/reactions

Etiologic

- living disease-causing microorganisms such as hepatitis, typhoid and influenza viruses

Mechanical

- shock waves, impact forces or the scattering of debris by explosions

Exposure and dose is determined by:
Time
Distance
Shielding

ACUTE (IMMEDIATE) VS CHRONIC (DELAYED) EFFECTS

Important factors to consider when determining the toxicity of a material are the relationships between concentration, exposure time and the threshold sensitivity of the person exposed.

Generally a serious exposure refers to a large, single dose received over a short period of time and an immediate response occurs **(acute)**.

A serious exposure may result from a small, single dose over a short period of time and there is no **Immediate** effect. This small dose may exceed the theshold sensitivity of the individual causing a serious **delayed** effect **(chronic).** The classic example of this is cancer.

Doses from several small exposures over a period of time **(chronic exposure),** causing no immediate effect may also result in a **delayed** effect. This cumulative effect may be serious or minor **(chronic).**

Localized—Effects observed on small areas of the body only

- Toxic inhalation injuries
- Chemical injuries of the Eye
- Chemical injuries to the Skin

Systemic—Effects observed throughout the body; more than one target organ or system impaired or damaged

- Anaphylaxis
- Hypovolemia—due to Central Nervous System depression
- Cardiac dysrhythmia—secondary to hypocalcemia from chemical exposure

Routes Of Entry Of Hazardous Materials Into The Human Body

There are four main routes for hazardous materials to enter into the human body for chemicals. An understanding of these roles is essential for the first responder so that he can recognize the need for the protective envelope provided by protective clothing, and its limitations. The four main routes are:

Inhalation:

Dusts and fine particles can be inhaled and find their way into the lungs, and then into the bloodstream to move to vital internal organs to cause damage. A largely unknown fact is that a substance can enter the respiratory tract through a punctured eardrum. If a first responder has a punctured eardrum, a medical evaluation is needed to determine if exposure to hazardous materials is an acceptable risk.

Skin absorption:

Some chemicals may be absorbed through the skin and enter the bloodstream. Absorption can also occur when a toxic substance comes in contact with the eye. The small blood vessels at the surface of the eye will readily absorb many toxic substances. Contact lenses can trap toxic substances between the lens and the eye where they will remain to cause damage to the eye or internal body organs. Always wear full face protection when a contamination risk is present. In these instances full body covering protection, which is designed to prevent chemical absorption by the body, is required. Structure fire fighting clothing **will not** meet this protective requirement.

Ingestion:

The ingestion of a hazardous chemical can occur by the simple act of touching your lips with your hand, licking your lips with your tongue, or smoking a cigarette. In each instance the consequences can be damaging or fatal. First responders should never smoke or eat at or near an incident site. They should also be fully decontaminated before they leave the incident site to a relief area for food or beverages.

Injection:

The injection of hazardous materials into the body sounds, at first, like a bad joke. Who in his right mind would inject themselves—especially when it is not required by a doctor? However, it can occur by stepping on a sharp object, or impaling yourself on or being cut by a sharp object while working at an incident site. It will happen before you even realize it has occurred and the reality of possibly being internally contaminated sinks in. The best precaution for this eventuality is to have protective clothing on, including steel shank and toed foot protection, and by strictly instituting and observing safe work habits.

Signs and Symptoms

Symptoms from a chemical dose are not usually immediate except when the dose is very highly concentrated. In most cases, however, effects are from small chronic doses or a single large dose with delayed effects. Unless the contaminant has "warning properties" the victim may not even be aware of his exposure and dose. Dermatitis is an inflammation of the skin which becomes red and swollen and appears as a rash. Dermatitis is the most common symptom of exposure to chemicals.

TYPE OF HAZARD	SIGNS AND SYMPTOMS
Chemical Hazard	Behavioral changes Breathing difficulties Changes in complexion or skin color Coordination difficulties Coughing Diarrhea Dizziness Drooling Fatigue and/or weakness Irritability Irritation of eyes, nose, respiratory tract, skin or throat Headache Lightheadedness Nausea Sneezing Sweating Tearing Tightness in the chest

Personnel experiencing any of the above symptoms should stop working and seek immediate medical attention.

Initial Treatment of Overexposure

This discussion of initial treatment is not intended to be a first aid course. It will point out ways of preventing further injury when overexposure occurs. In any case of overexposure, definitive medical care should be obtained as soon as possible.

Chemical overexposure

Initial treatment of chemical overexposure depends on the route of exposure and the particular hazardous material.

Prior to the initiation of medical treatment, as much information as possible should be obtained about the contaminant so **proper** treatment can begin.

If material is on the skin, washing with large quantities of water is the most common method of removing the substance. Cool water should be used to minimize opening the pores of the skin preventing further absorption.

If there is irritation of the eyes, large amounts of water should be used for flushing. This procedure should continue for a minimum of 15 minutes.

When inhalation of toxic material has occurred, oxygen should be administered if available. A non-rebreather mask should be used rather than nasal prongs to maximize the effectiveness of the oxygen given.

If toxic substances have entered the body by injection, the wound should be washed thoroughly. A sterile dressing should then be applied. The area should then be covered with a plastic wrap or similar covering.

Hazards Other Than Toxic Chemicals

The scene of a Hazardous Materials incident may present numerous hazards in addition to the chemicals we expect to find at the scene.

Fire and explosion, either occurring spontaneously or as a result of on scene activity is a constant danger.

Oxygen deficiency in confined spaces, such as tanks, pipelines, underground utility vaults and trenches, is a hazard commonly overlooked. The lack of oxygen may be due to displacement by another gas which may be toxic or simply inert. It may also be caused by a biological or chemical process which consumed much of the available oxygen in the space.

Ionizing radiation may be present at a scene. While commonly used, protective clothing offers protection from alpha radiation.

Biological hazards. Etiological agents may be released in a highway accident or from an incident at a fixed facility. Normal protective clothing and SCBA will not provide protection from Etiological agents!

Safety Hazards. By their nature, haz mat scenes may contain numerous safety hazards. These include but are not limited to holes, ditches and uneven terrain, slippery surfaces, sharp objects, improperly stacked material which may fall and unstable surface which may cave in or collapse.

Electrical hazards, such as downed or buried cables or improperly installed electrical equipment.

Heat Stress. Use of heavy protective clothing may lead to injury due to heat stress even in relatively cool environments.

Cold Exposure. Working for extended periods in cold environments can result in hypothermia (generalized lowering of body temperature) or frostbite (freezing of body parts). Wind and working on metal surfaces or with metal tools hasten the onset of injuries due to cold exposure.

INJURY VS. EXPOSURE/CONTAMINATION

There are three basic types of patients that the EMS responder can expect to encounter at a hazardous materials incident. These are:

- Injured only
- Contaminated/exposed only
- Injured *and* contaminated/exposed

While there is always a concern about the spread of contamination, treatment for injuries may be even more important. In fact, the care of injuries involving contamination, particularly open wounds, becomes a critical concern.

The EMS responder should also understand the difference between contaminated and exposed patients. Patients who have been "exposed" to a hazardous material **do not** have any residual contamination on their bodies. Most exposure cases involve the inhalation of gases. Patients who have been exposed, but have *not been contaminated* may be handled in the same fashion as any other person.

Module 3

MEDICAL OPERATIONS AND TACTICS

Section 3

DECONTAMINATION

INTRODUCTION

DEFINITION

Decontamination is the process of removing potentially harmful contaminants from exposed individuals and equipment in order to reduce the spread of contamination in the work area and to prevent inadvertent and unnecessary contact with contaminated materials.

Personnel should not handle a contaminated suit, tool, or person without proper protective equipment. Failure to do so may lead to skin absorption or inhalation of the contaminant, resulting in injury, illness, or death.

Not every patient you deal with will be contaminated. In fact, the *majority* of your patients **will not** be contaminated and can be handled in the routine fashion. However, until proven otherwise, you must *assume that every patient is contaminated.* Every attempt must be made to keep contaminated patients separated from those who are uncontaminated. This is best achieved by the use of *at least two* EMS units at the site of the emergency. One unit should be available to be dedicated to the treatment, care, and transportation of contaminated patients (if required) while the other should treat only those who have not been contaminated and do not require special handling procedures. A third may be needed for medical monitoring of personnel.

Units that have been set up and designated to handle contaminated patients need to be identified to EMS personnel and others on the site. One of the more popular means in use is to place a *red "X"* over the Star-of-Life symbol on the four sides of the vehicle. Red duct tape, or any red plastic or cloth tape can serve this purpose. This identification also becomes important upon arrival *at the medical facility.* Special entry locations may have been set up to deal with the contaminated patient so traffic control officers can direct marked units to the appropriate locations.

THE CONCEPT OF SECONDARY CONTAMINATION

An essential question to ask is, "What is the risk of *secondary contamination* (to rescuing personnel, transport vehicles, hospital emergency departments) from this chemical?" It is traditionally axiomatic in hazardous materials emergency management that chemicals should be considered both highly toxic and highly contaminating to personnel, vehicles, and the environment. However, a great many chemicals are very highly toxic *only* in the high concentrations found in the immediate exposure area (hot zone) but pose *little or no risk* to persons outside the hot zone. Small amounts of some chemicals may produce relatively little acute toxicity, but because they are suspected of causing cancer or other chronic disease they are considered to create a risk of secondary contamination.

Tables 1 and 2 list selected examples of hazardous substances which carry a high vs. a low risk for *secondary contamination.* The lists are meant to be illustrative, not exhaustive. Note that highly toxic chemicals may be found in *either* list. The Haz Mat Team, Regional Poison Control Center or County Health Department can assist you in determining the potential for secondary contamination of other hazardous materials.

SUBSTANCES WITH SERIOUS POTENTIAL FOR SECONDARY CONTAMINATION:

Unless the victim has been properly decontaminated, substances like those listed in Table 1 may persist in significant amounts on the victim's clothing, skin, hair, or personal belongings, and may jeopardize health care workers or other attendants. Recommended protective gear should be worn (Table 5 or Table 7). Reducing the potential for chemical exposure from any form of mouth-to-mouth resuscitation, including use of pocket one-way valve mouth-to-mouth resuscitation devices should be carefully considered when the victim has been exposed to one of the listed gases. If resuscitation efforts are necessary, a bag valve mask with reservoir device or manually triggered oxygen powered breathing device, should be applied to the patient. Contact with even lightly contaminated skin or clothing should be minimized prior to decontamination. *Proper decontamination by adequately protected personnel must be carried out before the victim is treated by prehospital or emergency department personnel.*

Table 1: Substances with a High Risk for Secondary Contamination

Examples:

- Acids, alkali & corrosives (if concentrated)
- Asbestos (large amounts, crumbling)
- Cyanide salts & related compounds (e.g., nitriles) and hydrogen cyanide gas
- Hydrofluoric acid solutions
- Nitrogen-containing and other oxidizers which may produce methemoglobinemia (aniline, aryl amines, aromatic nitro-compounds, chlorates, etc.)
- Pesticides
- PCBs (polychlorinated biphenyls)
- Phenol and phenolic compounds
- Many other oily or adherent toxic dusts and liquids
- Radioactive material

SUBSTANCES WITH LITTLE RISK FOR SECONDARY CONTAMINATION:

Many of the substances listed in Table 2 are highly toxic. However, even if they persist in the victim's clothing, skin, hair, or personal belongings after removal from hot zone, they are not likely to jeopardize health care workers or rescuers and are not likely to secondarily contaminate vehicles or the emergency department. *On-scene decontamination, if indicated, is desirable, especially clothing removal and victim wash, but not essential.*

Table 2: Substances with a Low Risk for Secondary Contamination

Examples:

- Most gases and vapors unless they condense in significant amounts on the clothing, skin or hair
- Weak acids, weak alkali and weak corrosives in low concentrations (excluding hydrofluoric acid)
- Weak acid or weak alkali vapors (unless clothing soaked and excluding hydrofluoric acid vapor)
- Arsine gas
- Carbon monoxide gas
- Gasoline, kerosene & related hydrocarbons
- Phosphine gas
- Smoke/combustion products (excluding chemical fires)
- Small quantities of common hydrocarbon solvents (e.g., toluene, xylene, paint thinner, ketones, chlorinated degreasers)

DECONTAMINATION PROCEDURES

Hazardous materials incidents involve numerous on-site problems and operational concerns. Common to all these responses is the threat of contamination. Decontamination must be considered an essential part of hazardous materials response operations. This module will detail the purpose and steps taken in field decon operations.

Personnel may become contaminated in a number of ways including:

- contacting vapors, gases, mists or particles in the air
- being splashed by materials during resuce or containment operations
- walking through puddles of liquids or on contaminated soil
- treating contaminated patients
- using contaminated instruments or equipment

Decontamination is the process of isolating equipment and personnel so as not to become contaminated, to reduce the spread of contamination, and making response personnel, victims and equipment free from contamination by eliminating or reducing harmful substances to a safe level. Response team personnel must undergo decon prior to removing their protective equipment. Victims need to be decontaminated before being turned over to EMS transport personnel. Equipment must be thoroughly cleaned so that its subsequent use will not lead to a spread of contamination.

Decon operations should be established prior to entering the Hot Zone for any reason, including rescue. As victims or personnel exit the Hot Zone (the isolation zone), they must go through the decon process. A Warm Zone (contamination reduction corridor) should be established

between the Hot Zone and the Cold Zone (support zone). Selection of a decon site should be based on water supply, ability to contain run-off, the proximity of drains and sewers, and the proximity to environmentally sensitive areas such as streams and ponds. Locations close to sensitive environmental areas should be avoided. The site should be upwind and uphill from the incident. The site must be a safe distance from the incident but close enough to allow easy access from the isolation zone and limit the spread of contaminants.

If the decon site must be located a long distance from the actual work area, transportation will be needed to move personnel. A pickup truck can provide easy access for the hazmat team. The driver will also need protective equipment, and the truck must be decontaminated after use. Matters will be complicated if weather or other conditions mandate an off-site decon. Contingencies for moving contaminated personnel should be made as a part of the initial planning effort.

Different chemical threats require varying levels of decon. In cases of extremely hazardous or unknown substances, the following minimum decon procedures should be complied with:

Remember, decon is a process that should be handled by trained personnel wearing appropriate PPE.

- Establishment of an entry/exit point: This point will be used by all personnel to enter and exit the Hot Zone. The use of one entrance will reduce the chance of contamination leaving the area (enlarging the Hot Zone). An emergency exit from the Hot Zone should also be established. This will allow for a secondary exit should conditions deteriorate and demand immediate evacuation. An equipment drop should be set up at the exit point so personnel can leave tools that may be needed again.
- Gross Decon (Primary Decon): This step may actually entail many intermediate steps. The personnel should undergo water rinsing and soap or solution washes to remove as much surface contaminant as possible. The number of washes will depend on the nature of the contaminant.
- Definitive Decon: This process is the thorough removal of the remaining contamination. Depending on the contaminant, and the time of exposure, Gross Decon may not be sufficient to remove all of the contamination. Extensive brushing may be used to remove the contaminant.
- Removal and isolation of protective clothing: Outer protective clothing should be removed at this station. The SCBA harness should be removed, but the mask should remain connected and in place on the worker's face. Outer gloves and overboots should be removed first. The protective clothing can then be removed with special care taken to reduce the risk of contaminating the worker. Once the outer clothing is off, the SCBA mask can be removed. Inner gloves are the last piece of protective equipment to be removed.
- Removal of personal clothing: With extremely hazardous substances, the removal and isolation of the worker's personal clothing is necessary. All clothing should be isolated for future cleaning or disposal.
- Personnel shower: In order to ensure complete decontamination, all personnel should shower. Liquid soaps work best. Special attention should be directed to the hair, fingernails and areas such as the underarms and groin. With known exposure, all run-off should be contained if possible.

and other contact surfaces. A mechanic should thoroughly inspect the vehicle after decon. Equipment may need to be steam-cleaned or sandblasted to ensure that it is clean. Resources such as Chemtrec, computer data bases and the EPA can be contacted for assistance in determining the extent of decon that is necessary.

Personnel should carry out a gross decon and isolation process on all equipment prior to completing procedures on themselves. Protective equipment and tools should be isolated for further cleaning and testing. Occasionally protective equipment cannot be totally decontaminated and must be disposed of. After the decon process is complete, the waste water and equipment (i.e., pools) may be disposed of as hazardous waste. Check with a representative from the D.E.P.E. or CEHA.

The personnel who are conducting the decon operations must also go through a cleaning process. Personnel should work their way through the decon area, becoming cleaner as they progress. The object is to be absolutely clean when leaving the contamination reduction corridor. They should decon each other, with the last person finishing procedures on himself.

A trend in the hazardous waste industry is to move toward "dry decontamination." While the term may be misleading, this process does allow for a minimum of liquid waste by-products.

This concept requires the use of layered, disposable protective clothing. A water/solution may be necessary for the areas of gross contamination such as overboots and gloves. Most clothing should be removed and disposed of without extensive washing and rinsing. This allows for easier cleanup and reduces the chance of secondary contamination from toxins trapped in reusable protective clothing.

Unfortunately, there is no method to immediately determine how effective decon procedures have been in removing permeated contaminants. Discolorations, stains, corrosive effects and substances adhering to objects can indicate that the contaminants have not been removed. However, observable effects only point to surface contamination and not permeation (absorption) into the clothing. Also, many contaminants are not easily detected.

Two common methods of measuring the effectiveness of decon procedures are swipe and permeation testing. Cloth or paper patches (swipes) are wiped over decontaminated surfaces and sent to a laboratory for analysis. Swipe tests can be done on protective clothing, equipment and skin. Permeation tests require that a piece of protective clothing be sent for analysis. However, both swipe and permeation testing provides after-the-fact confirmation. Along with visual observations, the test results can help evaluate the effectiveness of the completed decon procedures.

CONTAMINATED VICTIMS

Special attention needs to be devoted to contaminated patients. These patients pose a risk of secondary exposure to the transport personnel and vehicle. Also at risk is the receiving hospital and ED staff. Every effort must be made to decontaminate the patient prior to transport. Gross decontamination can be accomplished by simply removing the patient's clothing and using a water rinse. A more complete decon can be accomplished with a soap and water wash.

The process of patient decon should start with the removal of all clothing, jewelry and shoes. Then any visible contaminants should be removed from the patient. Dry particles can be gently brushed away, while heavy liquids should be blotted away with absorbent cloth. This will reduce the chance of water reacting with the chemicals or increasing the absorption of a nonsoluble liquid. Care must be taken not to scrape the skin during this process. Soft tissue damage (burns, bruises, abrasions or lacerations) increases skin permeability and the absorption rate of the toxin.

Soaps used for patient decon should be mild and non-abrasive. Tincture of green soap is desirable because of its slightly alkaline nature that approximates the body's pH level. Its alcohol base also helps to remove hydrocarbons and solvents from the skin. If green soap is not available, any mild liquid soap such as Dawn dishwashing detergent will work. Never use decon solutions on skin. The patient should be washed with soft sponges to reduce the chance of skin abrasion.

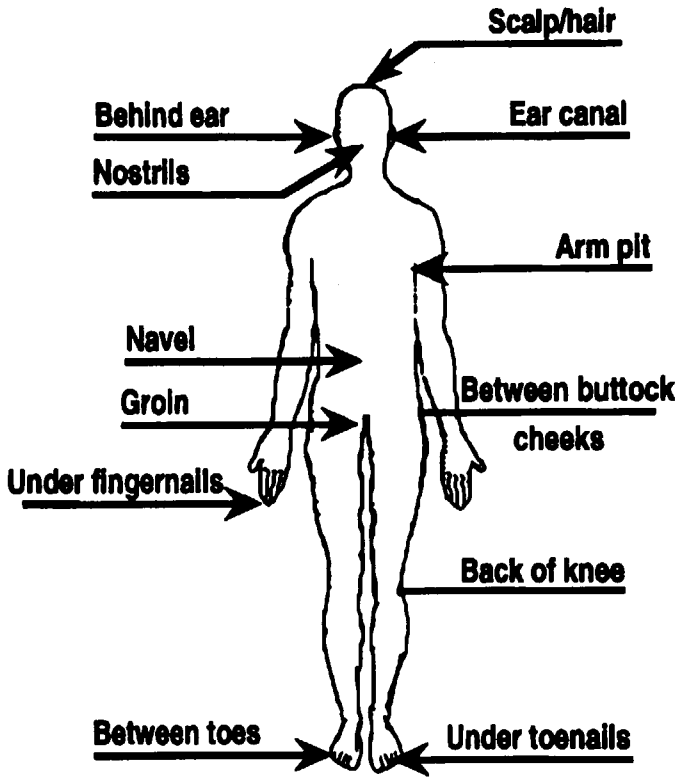
Water spray should be mild to avoid aggravating any soft tissue damage. The temperature should be warm—never hot. If cold water must be used, there is a risk of hypothermia. Try to contain the run-off as hazardous waste, but do not delay treatment in life-threatening situations if containment is not available. In these cases, try instead to avoid allowing run-off to enter drains or water sources.

Patient decon should begin at the head and then proceed to any areas where skin is damaged. Care must be taken not to flush contaminants into wounds. Carefully wash and rinse the wound area from the center out. After the wound area is clean, cover it with a water-occlusive dressing or plastic wrap to preclude any further contamination. Once all wound areas are clean, procedures can progress to other areas of the body. Ear/nose cavities should be irrigated, hair washed and fingernails cleaned. Special attention should be focused on opposing surface areas, such as the underarms and groin. Eyes should be flushed at the scene and irrigation continued during transport, preferably with saline.

Privacy is an important consideration in field decontamination activities. In order to obtain cooperation from the patient, steps to assure patient privacy must be undertaken. Tarps, salvage covers, sheets, blankets, and other such items may be used to construct privacy screens on-site. Remember, that both male and female decontamination areas may be needed.

Weather is also an important consideration in determining where and how long a patient will be deconed. You may not want to remove the clothing of a patient and then wash him/her down with water when the outside temperature gets below 30°F. At best, the patient still needs to be gross decontaminated. Through proper planning, the necessary equipment (i.e., tents, inflatable decon set ups, heaters, water heating systems) needed to complete a cold weather decon can be obtained. Make sure that your response agency has planned and practiced for these types of emergency conditions.

Clothing must be provided to ambulatory patients following field decontamination activities. Disposable clothing, such as Tyvek™ coveralls or paper "scrubs," may be used for this purpose. If such clothing is not available, blankets, disposable sheets, etc., can be used. The Red Cross or Salvation Army may be able to assist in this task.

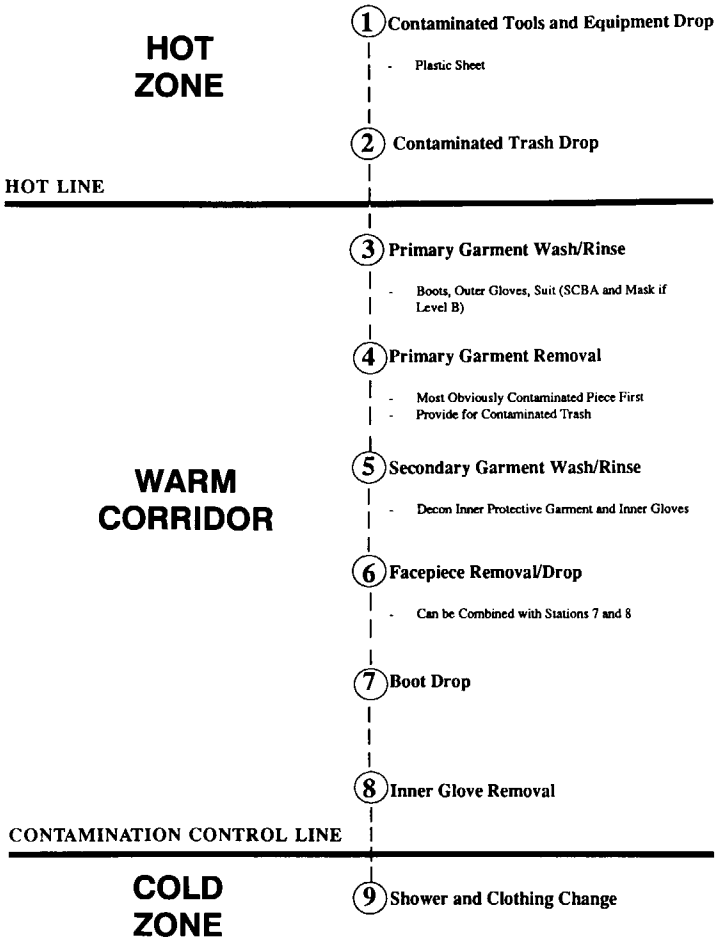


Frequently missed body zones during decontamination

Initial patient stabilization should be carried out simultaneously with decon. This will mandate that the person providing patient care is trained in the use of and provided with proper protective equipment. Under no circumstances should personnel be allowed to use protective equipment without proper training. If proper training and equipment are unavailable, arrangements should be made with the local fire department for a co-response to all possible chemical emergencies.

Under ideal circumstances, patients should be fully decontaminated prior to transport. In most cases, this will eliminate the chance of secondary contamination of response personnel. However, hazardous materials incidents are unlike many of our standard responses. Often, the incident will continue to escalate and can endanger an entire community. In such cases, total commitment cannot be focused on complete patient decontamination. Patient care is only one aspect of these incidents, and manpower may be limited. As a result, patient decon may be less than optimal.

Nine-Step Personnel Decontamination Plan



Haz/Mat Incident Team Members

PERSONNEL	RESPONSIBILITIES
Chemical Safety Officer (CSO):	Provides technical consultation/information for handling the incident. Overall management of non-medical aspects at the scene. A Haz/Mat team member might be a possible backup.
Security:	Sets up decon area. Restricts access to ER. Directs traffic. Restricts access to news media.
Decontamination Team:	Decontaminates patient. Makes sure all equipment is properly decontaminated and disposed of. Provides for safe handling of all waste. Cleans up decon area when procedures are completed.
Medical Team:	Provides for treatment of patient.
Public Information Officer (PIO):	Meets with members of the news media. Provides all press releases.

Decontamination Area Set Up

The decontamination area is set up by both security and members of the decon team.

Security:	Marks off restricted area with barrier cones and warning tape to designated restricted area depending on hospital. All personnel not associated with decontamination of the patients are to be restricted from the area by security. Security directs all ambulances, rescue units, other transportation vehicles with CONTAMINATED PATIENTS to the decon area.
Decon Team:	Assists in setting up the decon containment pool and shower setup. Prepares decontamination supplies, wash solutions, hose to water supplies. Tests water quantity and quality before the patient arrives. Determines if any additional supplies or materials are needed. Decon team suits up and waits for patients.

Once patients are in the area, only properly protected decon members or medical staff, if in PPE, are permitted in the area.

Module 3

MEDICAL OPERATIONS AND TACTICS

Section 4

PATIENT CARE

Patient Management Under Mass Casualty Conditions Involving Hazardous Chemicals

Basic medical procedures in a large-scale hazardous materials incident are not substantially different from life-saving measures in other mass casualty disasters. Primary attention to the ABC continues to have first priority with decontamination performed at the same time. A chemical disaster may overwhelm any one hospital, particularly if it occurs along with another disaster such as an earthquake. Hospitals need to preplan what they will do if they are overwhelmed with hazmat patients.

There are, however, several important differences in disasters involving hazardous materials. Such differences include the need for the effective decontamination of exposed patients and response personnel, and the need for effective safety measures to protect response personnel. Training in the appropriate procedures to be followed is essential for potential responders to a hazardous materials incident involving mass casualties. Standard principles of triage apply in chemical disasters, except in exposures to very toxic substances. The patient, injured or not, must be decontaminated before being transported to the emergency department to protect EMS and emergency department staff.

Effective decontamination consists of making the patient As Clean As Possible (ACAP). This means that the contamination has been reduced to a level that is no longer a threat to the patient or the responder. The recorder notes on a diagram of the body the areas found by the physician to be contaminated.

Considerations for Patient Treatment

Primary goals for emergency medical personnel in handling a contaminated patient include termination of exposure to the patient, patient stabilization, and patient treatment—while not jeopardizing the safety of emergency medical personnel. Termination of exposure can best be accomplished by removing the patient from the area of exposure and by removing contaminants from the patient. Basically, a contaminated patient is like any other and may be treated as such except that staff must protect themselves and others from dangers due to contamination.

Personnel must first address life-threatening issues and then decontamination and supportive measures. Priority should be given to the ABC with simultaneous contamination reduction. Once life-threatening matters have been addressed, emergency medical personnel can then direct attention to thorough decontamination, secondary patient assessment, and identification of materials involved. It is important to remember that appropriate personal protective clothing must be worn until personnel are no longer in danger. Therefore, the sooner the patient becomes decontaminated the sooner personnel may reduce protective measures or downgrade the level of protection. Primary and secondary surveys should be completed as conditions allow. In treating patients, personnel should consider the chemical-specific information received from the hazardous materials response resources. In multiple patient situations, proper triage procedures should be implemented. Presenting signs and symptoms should be treated as appropriate and when conditions allow. The sooner a patient has been decontaminated the sooner he or she can be treated like a "normal" patient. Orders of the designated poison control center and attending physician should be administered. Invasive procedures, such as IVs or intubation, should be performed only for life-threatening conditions, until decontamination is performed.

Module 3

MEDICAL OPERATIONS AND TACTICS

Section 5

TRANSPORT

These procedures may create a direct route for introducing the hazardous material into the patient. The patient should be frequently re-assessed because many hazardous materials have latent physiological effects.

Note: The attending staff must remember that since exposure to some substances can result in serious delayed effects, sustained observation and monitoring are required.

Critique

As soon as possible after each incident, all participating units should send knowledgeable representatives to review the measures that were taken by each unit or agency. The purpose of this review is to examine which activities succeeded and which did not, and to evaluate the overall coordination effort.

Are injuries related to the HazMat?
- Severity of injuries
- Route of entry

Are materials still affecting the patient?

Can Decon be performed?

What is the status of the patient?
- entrapped, contaminated, uninjured

A patient who is not definitively decontaminated should only be delivered to EMS if:

1. The patients condition is such that only Gross Decon can be performed.
2. The chemical(s) involved cannot be completely removed from the patient in the field and pose little risk to EMS.

TRIAGE

The victims removed from the Hot Zone must be decontaminated before definitive treatment can begin. A triage area should be established **AWAY FROM** (and upwind of) **THE SITE**. Impress on the Incident Commander that the triage area chosen must be far enough from the incident that a shift in wind will not necessitate moving triage. Always choose security over proximity when selecting this site.

As you know, in triage the most critical injuries are identified and the priorities for treatment are established. Triage is an ongoing process that continues throughout the operation. When hazardous materials are involved, all personnel must remain on guard to avoid being contaminated by the victims.

In addition to normal triage assessment, the following information must be determined:

- To what degree is each injury related to the hazardous materials involved?
- Which injuries are most severe (and should be treated first)?
- What is the route of entry to the body (via inhalation, ingestion, skin, eye)?
- Are the materials still acting upon the patient? A patient who has not been fully decontaminated may be delivered to the EMS personnel if:
  - The patient's condition is such that complete decontamination cannot be performed.
  - The chemical involved cannot be removed from the patient in the field.

WHAT ARE SOME OTHER TRIAGE CONSIDERATIONS?

_____

_____

_____

Triage

- **utilize the S.T.A.R.T. system**

  The START (Simple Triage And Rapid Transport) system should be utilized to evaluate all patients, at four locations minimum: incident site, triage/life safety area, treatment, and transport.

  The START system evaluates:
  Mobility, Airway and Breathing, Circulation and Mental status.

  Patients will be divided into four categories:

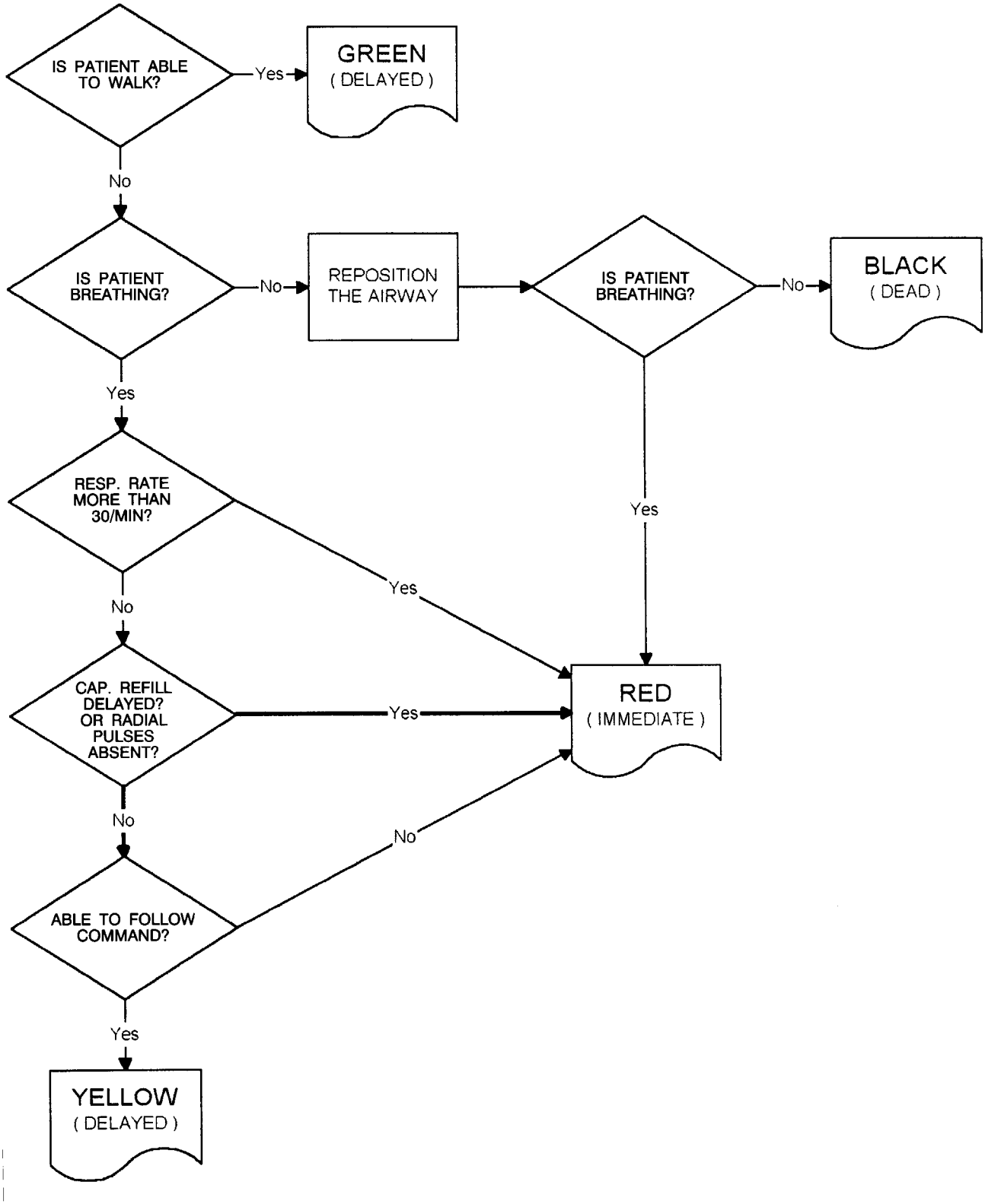
Tag Color	Priority	Description
RED	1	Immediate
YELLOW	2	Delayed
GREEN	3	No ambulance required
BLACK	0	No EMS required at all

- **utilize MET-TAGS**

  The MET-TAGS triage tag system is most effective with the START system of triage. It is the standard tag adopted by the State of NJ. The colors and priorities of the tags are listed above.

THE S.T.A.R.T. SYSTEM

Simple Triage and Rapid Transport



TAGGING PATIENTS

- Tagging (with triage assessment) is especially important when more than one patient is involved. Subsequent treatment is based on this information.

- Tag information should include:

  The following should be documented at the time of triage:

  - Decontamination completed—will be indicated by a large "D" written on the tag.

  The following should be documented at the time of treatment:

  - Vital signs and symptoms.
  - Exposure materials, duration and routes.
  - Treatment to date.
  - Additional injury assessment.
  - Chronic illness.
  - Allergies.
  - Current medication.

WHAT OTHER TAGGING INFORMATION SHOULD BE ADDED?

_____

_____

_____

Remember: Good triage assessment and tagging (even with a single patient) speeds admitting and advanced treatment at the hospital.

TREATMENT

Medically trained decon personnel may begin basic life support treatment during decontamination before the victim has been removed to triage.

INJURY VS. EXPOSURE/CONTAMINATION

There are three basic types of patients that the EMS responder can expect to encounter at a hazardous materials incident. These are:

- Injured only
- Contaminated/exposed only
- Injured *and* contaminated/exposed

While there is always a concern about the spread of contamination, treatment for injuries may be even more important. In fact, the care of injuries involving contamination, particularly open wounds, becomes a critical concern.

The EMS responder should also understand the difference between contaminated and exposed patients. Patients who have been "exposed" to a hazardous material **do not** have any residual contamination on their bodies. Most exposure cases involve the inhalation of gases. Patients who have been exposed, but have *not been contaminated* may be handled in the same fashion as any other person.

Treatment for victims of hazardous materials exposure is **NOT** like conventional emergency medical treatment. Although broken bones, bleeding and other conventional injuries may be evident, respiratory distress, skin burns or exposure and other, less obvious life threatening injuries must be detected and treated.

More than basic life support treatment is frequently necessary for victims of hazardous materials incidents.

- Check with the Safety Officer or EMS Branch officer for special emergency medical considerations.
- Provide oxygen, the antidote for most inhalation exposures. **DO NOT use mouth-to-mouth or pocket mask resuscitation.**
- Flush exposed eyes with isotonic saline for at least 15 minutes prior to transport (and during transport, if possible). Use potable water if saline solution or sterile water for irrigation is not available or is in short supply.
- In case of ingestion, **DO NOT induce vomiting without consulting a physician.**
- Protect yourself and your equipment with plastic or rubber coverings, etc. Wear appropriate gloves, aprons and other protective gear when examining and assessing patients' injuries.

Remember: Vital signs, especially BP, breath sounds, pulse and respirations, MUST be monitored often. The patient's condition can change very rapidly after exposure to a hazardous material.

Remember: Treatment of hazardous materials injuries is both less convenient and can be more dangerous to you than the treatment of conventional medical emergencies. DO NOT LET DOWN YOUR GUARD!

TRANSPORT

Transporting patients to the hospital ED (Emergency Department) is the culmination of many hours of training and preparation. Part of that preparation is knowing which ED's are BEST PREPARED to receive the victims of hazardous material exposure.

- Any personnel or equipment which may have become contaminated must go through appropriate decontamination before leaving the scene. This may require that the patient be sent in a second ambulance with a crew which is uncontaminated.
- Any equipment that may have become contaminated must not be removed from the scene until it has been decontaminated.

CONTACT AND TRANSPORT TO THE APPROPRIATE EMERGENCY DEPARTMENT

- Early contact essential

Be sure to communicate the following:

- number of patients
- nature of accident
- substance(s) involved
- route of exposure
- duration of exposure
- associated trauma
- victim exam findings and vitals
- initial signs and symptoms
- treatment administered
- signs and symptoms now
- decontamination carried out
- need for further decontamination
- estimated time of arrival

Protect ambulance and personnel from secondary contamination

AMBULANCE CONSIDERATIONS

- Exposure potential exists if contaminated patients are transported.
- New ambulance units meeting KKK-A-1822 C 3.13.6 standard are required to have a complete air exchange every 2 minutes. Older units have a relatively poor air exchange rate, with resulting increased risk of secondary exposure to EMS personnel.
- Windows are bi-directional, allowing contamination to come back into the ambulance. Opening rear windows may allow exhaust fumes (CO) into the ambulance.
- Lining the ambulance patient compartment in plastic may increase secondary inhalation hazard by limiting ventilation.

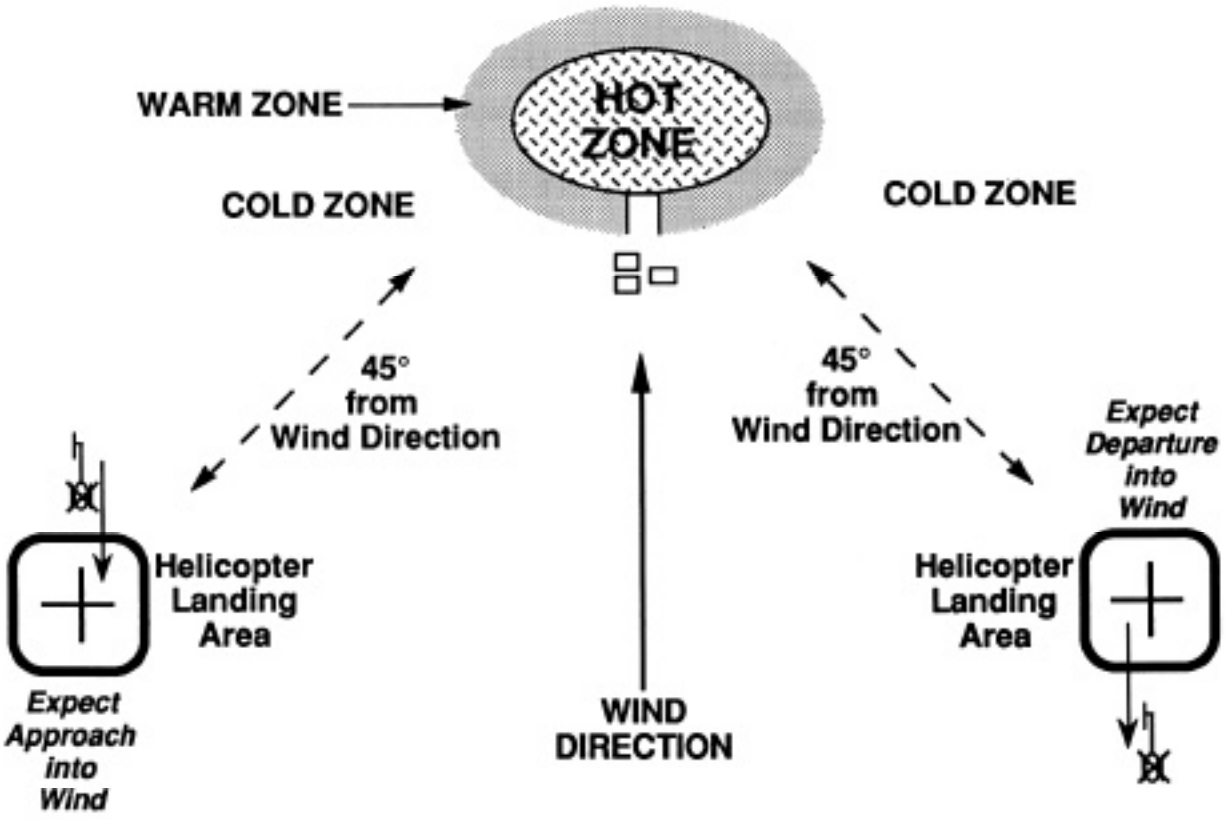
REDUCE EXPOSURE POTENTIAL

- Decontaminate before transport
- Reverse isolation procedures such as transportation bags, plastic, blankets, or zip front body bags may reduce EMS responders' exposure risk. However, if patient has not been fully decontaminated, these procedures may increase the patient's chemical exposure risk.
- Provide adequate ambulance ventilation (intake and exhaust fans of proper size).
- Provide adequate EMS personnel protective equipment.
- Patients with toxic ingestion may vomit during transport. The vomitus may contain volatile compounds that may present an inhalation hazard. Vomitus should be immediately islated in a sealed plastic bag.

AEROMEDICAL PROCEDURES ALTERED

- Usually contraindicated unless rapid transport is necessary and patient is COMPLETELY decontaminated or was exposed to a chemical with no risk of secondary contamination. Vomitus still may pose a threat, and measures should be in place for immediate isolation of emesis.
- Helicopter landing area should be a safe distance from the hot zone to avoid spreading the contamination.
- Flight crews must be advised of scene conditions to ensure a safe approach.
- Many flight services are apprehensive about transporting patients from a HazMat scene. If helicopter transport is necessary in your area, pre-incident plans should be made with this flight service. Explain decontamination procedures and demonstrate safe scene practices. This may serve to resolve any potential problems.
- Flight services should not be ignored in HazMat response planning. They may be the only reasonable way to transport severely injured patients from rural areas. Helicopters may also be called to an unrecognized HazMat incident and be on scene very quickly. Flight crews should receive adequate training in hazardous materials recognition and response.
- Helicopter transport of hazardous materials victims should be used when needed and when safety concerns allow.

LOCATION OF HELICOPTER LANDING ZONES AT A HAZARDOUS MATERIALS INCIDENT



AT NO TIME SHOULD ANY AIRCRAFT PASS OVER THE WARM OR HOT ZONES AT A LOW ALTITUDE. AIR DISTURBANCE COULD EASILY SPREAD VAPORS OR LIGHT PARTICULATE CONTAMINATION.

EMERGENCY MEDICAL SERVICES
SUGGESTED VEHICLE EQUIPMENT FOR
HAZARDOUS MATERIALS INCIDENTS

- Binoculars to assess scene from a safe distance.
- Plastic (10-20 mil, preferably clear) trash bags (3 or 4 mil) to isolate and dispose of contaminated articles and toxic vomitus. Plastic sheeting to cover floor of ambulance in the rare case where a contaminated victim must be transported, or if the victim might vomit ingested toxic material.
- A large supply of oxygen to treat breathing problems caused by exposure to Hazardous Materials. (More than is usually carried.)
- A large wash basin, bucket, or plastic waste basket which can be lined with a trash bag to collect contaminated eye wash water or vomitus.
- Disposable plastic-coated blankets (or "chucks") to soak up and isolate liquids from a decontaminated patient. Use these for absorbing toxic vomitus.
- Disposable gowns and slippers for patients who must remove contaminated clothes at the scene and for EMS personnel (long sleeve gowns) to cover outer clothes.
- Disposble surgical or examination gloves.
- Surgical or other paper masks.
- Waterproof disposable shoe covers.
- Splash goggles or face shields to protect EMS personnel from splashes while they work on the patient.
- Inexpensive stethoscopes, blood pressure cuffs and other gear which can be discarded if contaminated.
- Isotonic saline and IV tubing for eye irrigation.
- A Bag-Valve Mask (BVM) or similar device in lieu of mouth to mouth respiration. (Pocket masks are NOT acceptable.)
- Liquid soap for washing off oily contaminants.
- Epsom salts for soaking hydrofluoric acid burns.
- Shears or sharp knife for removing clothing from victim.
- Copy of the current "D.O.T. Emergency Response Guidebook," and other appropriate medical management publications and protocols.

Module 3

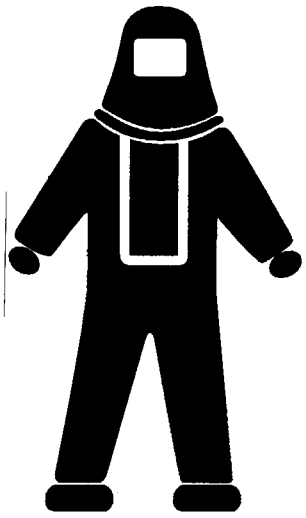
MEDICAL OPERATIONS AND TACTICS

Section 6

REHABILITATION

Medical Considerations for Wearing CPC

The most common cause of injury to workers involved in hazardous materials mitigation is heat stress—induced by the wearing of chemical protective clothing. With the availability of higher capacity SCBAs, the restricting factor on work periods has become the health, and wisdom, of the individual. We must adequately assess the health threats to all workers in CPC and properly implement the necessary safeguards to ensure well-being. Stress management techniques and medical monitoring of emergency response personnel are the principal points in accomplishing this goal.



Both physiological and psychological stress can severely affect response personnel. Under certain conditions, stress can contribute significantly to accidents or harm workers in other ways. This chapter will provide information about the physiologic and psychological stress encountered by site workers and discuss the important aspects of a medical monitoring program.

Stress Programs

Any complete program that attempts to reduce the potential for abnormal physical stress or mental anxiety should incorporate pre-incident, on-site and post-incident components:

- Workers must be periodically examined by medical authorities to determine if they are physically, and if possible, psychologically fit to perform their duties.
- Continual practice and training must be provided in using PPE, especially Self-Contained Breathing Apparatus and Chemical Protective Clothing.
- An effective safety program must be implemented, and concerted efforts made, to protect the worker. These actions help to ensure personnel that their health and safety will be protected now, and in the future.

Stresses of Encapsulating Garments

Many hazardous materials responders and team managers tend to underestimate the risks to personnel working in chemical protective clothing because they focus on the environment and the chemicals, and fail to adequately recognize the health risks associated with wearing CPC.

Technological advances in chemical protective clothing, SCBA and umbilical air systems make it possible to work in hazardous environments for much longer periods than was ever permitted before. This presents a significant increase in the health risk to personnel as they become limited more by their own physical conditions than by the limitations of their protective equipment. Yet, this very same protective equipment can become a *"hostile interior environment"* as personnel are subjected to 100% relative humidity and elevated temperatures within 7 minutes of donning the suit.

Response personnel must also recognize situations where there is a potential for protective clothing to become breached or otherwise damaged. Protective ensembles, by their very design and function, are intended to prevent a hostile exterior environment from entering the suit and reaching the individual. This infers that the suit will also keep hostile substances *inside* the suit, next to the individual, once they have entered. It can create a situation where the substance concentration is higher in the *interior* of the suit than on the exterior.

Incident Stressors

Personnel operating in chemical protective clothing are typically subjected to four types of stressors: environmental, mechanical, psychological and physiological.

- Environmental stresses include temperature and humidity both outside and inside the suit, wind conditions, terrain, confined spaces, etc. These factors can affect both the physical and mental state of personnel wearing CPC. These factors must be taken into account during work mission planning activities.
- Mechanical stresses are caused by faults or defects in the protective equipment; limitations inherent in the CPC (mobility, dexterity, visibility, etc.); or objects that come into contact with the garments creating punctures, tears, rips or abrasions. Close inspection of the suits, careful planning at the incident, and attention to detail in the task, are the best preventative techniques for mechanical stress.
- Physiologic stresses are created by the physical characteristics of the individual: age, fitness, health and personal habits. We will dicuss these shortly.
- Psychological stresses are manifested by anxiety and/or claustrophobic reactions to operating in adverse environments, with dangerous materials, or under unfamiliar conditions. These may be due to the incident, the individual, or the chemical protective equipment itself. Often these psychological stresses have lingering effects that must be dealt with during Incident Stress Debriefings and/or individual counseling conducted by trained professionals.

Physiological Factors

Just wearing an encapsulating garment puts personnel at considerable risk for injuries ranging from heat-related illnesses to various physical traumas, chemical toxicity, or psychological harm. Conditions related to the incident (the environment, the CPC itself, difficulty and duration of the work performed, etc.) are part of the problem. Individual physical and emotional characteristics of the personnel themselves are also significant contributing factors. Some of the factors that predispose individuals to injuries include lack of physical fitness, lack of familiarity, anxiety, age, dehydration, obesity, personal habits, illness, sunburn, diarrhea and disease. Each are discussed below:

- **Lack of physical fitness** is an avoidable condition that should not be tolerated by employers or employees. Agencies should develop doctrines that encourage only the most fit to use chemical protective clothing and be members of a hazardous materials team. Personnel who have low work capacities are more susceptible to heat-related injuries.

- **Lack of familiarity** is another inexcusable factor in injuries. Team members should practice and drill with various CPC until they are as comfortable with them as they are with any other tool.
- While **anxiety** may be overcome with time and training, **claustrophobia** is too serious of a condition to risk an employee's health on. No one with this condition should be allowed to work in chemical protective clothing, particularly the encapsulating kinds.
- **Age** affects personnel in numerous ways; general health, reaction time, stamina, and dexterity are but a few. Younger individuals are often preferred for assignments that require working in CPC. However, older individuals who are physically fit and experienced in dealing with hazardous materials are a valuable resource, and should not be overlooked merely because of age.
- **Dehydration** caused by sweating, diarrhea or other conditions is one of the principal causes of heat-related injuries. Therefore, anyone who exhibits symptoms of dehydration (unusual thirst, etc.), or signs of other maladies for that matter, should not be assigned to duties that require the use of CPC.
- **Obesity** causes excessive stress on the body, especially to the cardiovascular system, under normal conditions. Wearing CPC will put additional stress on the body. Obese individuals should not be chosen for tasks requiring the use of CPC.
- **Personal habits** can greatly affect an individual's health. Alcohol, smoking and drug use can result in diminished lung capacity and mental alertness. Even an individual who is experiencing the effects of a "rough night on the town" should be barred from wearing CPC. Over the counter medications, especially decongestants and antihistamines, may increase the risk of heat stress.
- **Infections or other illnesses** preclude personnel from operating at "peak efficiency." Strenuous physical activity will further deplete their already overtaxed energy and immune systems. In addition, these individuals should not come into contact with others to whom they may spread their illness or infection.
- A **sunburn** can cause extreme discomfort when it's irritated. The body is already coping with one injury. Aggravating that injury may cause further harm to the individual.
- **Diarrhea** depletes large amounts of body fluids. Expecting an already dehydrated individual to operate in an environment where fluid loss is the greatest hazard is tantamount to gross negligence. Diarrhea may also cause other problems for personnel confined in an encapsulating suit.
- **Chronic diseases,** such as emphysema and bronchitis, can severely limit the physical capabilities of personnel. Emergency response personnel who manifest signs of chronic illnesses should be prohibited from joining hazards materials teams.

Work Tolerance

Chemical protective clothing directly influences work tolerance. Heavy, bulky suits are much more difficult to work in than lighter suits. Level A suits have been known to reduce work tolerance by as much as 50%. The slight margin of comfort created by multi-piece suits helps to explain their popularity over the encapsulating type.

Heat stress and work tolerance are interrelated. As the work duration increases, heat tolerance decreases. Chemical protective clothing adds weight, bulk and heat to the wearer. It also severely reduces the effectiveness of normal heat exchange mechanisms such as evaporation of sweat, convection from cooling currents and radiation of body heat. The interior of the suit begins to behave much as a sauna does with temperatures rising to well over 100 degrees F. The temperature inside the suit can be more than 25% higher than the external ambient temperature. At the same time, interior suit humidity rises until it is near 100%. This not only severely represses the body's cooling mechanisms, it acts to reflect heat back towards the body, elevating core temperatures even further. The result can quickly become catastrophic if the metabolic processes are not managed properly.

As an example, FEMA studies have shown that personnel wearing Level A chemical protective clothing, working hard in a typical California summer climate, lost approximately 5% of their body weight within the duration of just one air bottle (about 45 minutes). This completely disrupts normal blood chemistry and is a very dangerous medical condition.

Effects of Cold Exposure

Personnel working in extreme cold, even for a short time, may experience severe injury to the surface of the body (frostbite) or profound generalized cooling (hypothermia). The result may include permanent injury or death. Personnel exhibiting signs of hypothermia should be immediately removed from the environment, placed in a warm location, covered with blankets and provided with warm liquds to drink.

Two factors influence the development of a cold injury: ambient air temperature and wind velocity. "Wind chill" is used to describe the chilling effect of moving air in combination with low temperatures. For instance, 10 degrees F with a wind of 15 miles per hour is equivalent in chilling effect to still air at –18 degrees F. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. This simple doubling in wind speed can quadruple the wind chill factor. The effects are far worse when the skin is wet. Water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical protective equipment is removed and the clothing beneath is soaked with perspiration.

Local injury resulting from cold is included in the generic term *"frostbite."* Areas of the body which have high surface-to-volume ratios, such as fingers, toes and ears, are the most susceptible to frostbite. Frostbite of the extremities can fall into three categories:

- Frost Nip or Incipient Frostbite: Characterized by sudden blanching or whitening of the skin.
- Superficial Frostbite: Characterized by skin with a waxy or white appearance that is firm to the touch, but the tissue beneath is resilient.
- Deep Frostbite: Characterized by cold, pale skin that is solid to the touch. This is an extremely serious injury.

Systemic *hypothermia* is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering: the body's automatic mechanism to generate heat through muscle contractions.
- Apathy, listlessness, sleepiness, and sometimes rapid cooling of the body to less than 95 degrees F.
- Unconsciousness, glassy stare, slow pulse and respiratory rates.
- Freezing of the extremities.
- Death.

Always consult available standard reference books any time signs and symptoms of hypothermia become visible.

Work Mission Duration

Work mission duration is an important factor in safeguarding the health and well-being of response personnel. Work mission duration is dependent upon a number of factors including travel and decontamination times, environmental conditions, work load, CPC, and the limitations of the personnel themselves. It must also include a safety factor to protect against problems that may arise during the operation.

A "Work Mission Duration" form, such as the sample on the following page, can be used to provide a relatively subjective analysis of safe operting times. The form provides recommended work times based on environmental conditions. Actual operating times can be adjusted based on available air supplies. However, there are two important points to remember when adjusting work times. First, the person with the lowest remaining air supply dictates the time remaining for all team members. Second, return travel time, decontamination time and the safety margin must all be deducted from the total time remaining in order to determine the safe operating work time.

One other word of caution: umbilical air supplies are almost limitless. It's even more critical to follow the recommended work times when using umbilical air supplies to prevent over-exertion injuries to personnel.

Rest Periods

Providing adequate rest periods between work missions is just as important as limiting work mission duration. The Environmental Protection Agency has established guidelines for responder rehabilitation times based on research of endurance rates. This is one tool which is available to response teams. Drills and training exercises should be used as an avenue to measure and test rest period durations in given environments. However, regardless of how an agency determines adequate rest periods, the time frames must be predicated upon measurable factors such as the anticipated work levels, environmental conditions, type of protective garments, individual workers' characteristics and fitness, and medical monitoring results.

Work Mission Duration

Incident Name: _____ Date: _____ Location: _____

	Air Supply	30 Minutes	45 Minutes	60 Minutes	Umbilical Air
 Out of Air	Safety Factor				
 Need Help	Travel time (times 2)				
	Environmental Conditions (L-0, M-5, H-10)				
 Evacuate	Work Load (L-0, M-5, H-10)				
	Decontamination (maximum)				
 O.K.	Other				
	Operating Work Time (To be amended during incident as dictated by actual air supply)				

 Need Assistance with Repair	Recommended Work Time (Between Rest Periods)* When wearing impermeable or semi-impermeable Chemical Protective Clothing			
	Air Temperature (Maximum)	Sunshine (Radiant Heat Exposure)		
		Full Sun Shadows 100% of time	Partly Sunny Shadows 50% of time	Full Shade No shadows from sun
 Situation Under Control	70°F	60 min. of work	90 min. of work	120 min. of work
	75°F	30 min. of work	60 min. of work	90 min. of work
	80°F	20 min. of work	30 min. of work	60 min. of work
	85°F	15 min. of work	20 min. of work	30 min. of work
	90°F	15 min. light work	15 min. of work	20 min. of work
	95°F	Extreme Danger	Danger	15 min. of work
	*Reference: Occupational Safety & Health (OSHA) Guidance Manual for Hazwaste Site Activity (Table 8-10)			

Work Mission Duration Form Instructions

Each part of the Work Mission Duration Form which needs to be completed is explained below:

1. **Air Supply:** Across the top of the form are standard air supplies (30/45/60 minute air bottles and umbilical air). When completing the form, enter information into the column that corresponds to the air supply being used by the Haz Mat Team.
2. **Safety Factor:** A standard rule of thumb is that personnel should be able to perform the task, exit the zone, complete decontamination, and begin doffing before the low-air alarm bell sounds. On most SCBAs the bell will alarm within approximately a 5 minute reserve. Therefore, 5 minutes is an acceptable standard entry in this portion of the form.
3. **Travel Time:** This should be a close estimation of the travel time to and from the site.
4. **Environmental Conditions:** Environmental conditions impact emergency response personnel before they don PPE, while they are working, and after they doff the garments. Temperature and humidity are the primary factors to be concerned about. The recommended entries are as follows:

Entry	Environmental Condition
0	Cool and Dry
5	Warm and Moist
10	Hot and Wet

5. **Work Load:** The type of work is another measurable factor. The greater the work load, the greater the impact. The recommended entries are as follows:

Entry	Work Load
0	Light
5	Moderate
10	Heavy

6. **Decontamination:** Decon takes time to accomplish. The more people who need decontamination, the more time will be required. The number entered into this row should account for the time it takes to decontaminate *all* team members.
7. **Other:** This row provides a place to account for other factors which impact air supply such as age, obesity or personal habits. Again, it is not recommended that these individuals participate in these types of activities, but sometimes there is no other choice.
8. **Operating Work Time:** The estimated operating work time is entered at the bottom of the form. To determine the operating work time, add the entries from all the previous rows, then subtract that number from the total air supply available.

Field Monitoring

Field monitoring must include conditions relating to the health and well-being of emergency response personnel. Temperture, relative humidity and wind speed are the minimum components necessary to define the environmental parameters for personnel at the site.

Ambient air temperature and relative humidity are combined to determine the "heat index." This index is a measure of the body's ability to cool itself. As already mentioned, the most important cooling process of the body is evaporation. The amount of moisture that air can hold is a function

of the ambient air temperature. The higher the temperature, the more moisture that it can hold. When the air is already high in moisture content, less moisture can be removed from our bodies. In other words, humidity decreases the effectiveness of evaporation and general cooling.

The lungs are an important source of evaporation in the human body. While the following is an oversimplification of the physiology involved, it is important for responders to understand the impact of humidity. As the moisture content in the air increases, the exhaled air in the lungs begins to approximate the same moisture level and no evaporation occurs. When the moisture content in the lungs is high, the amount of oxygen in the lungs is diminished. Additionally, the lungs serve to expel wastes dissolved in water, much as urine does. When the moisture in the lungs cannot evaporate, these wastes begin to build up. This is one reason why people tend to feel such discomfort in high humidity.

As already indicated, the wind speed (or "wind chill factor") is another important condition. It can be beneficial in warm climates, and dangerous in cold ones. Wind chill charts should be a standard reference for emergency response teams as they monitor the well-being of personnel at the scene.

Heat Related Illnesses

Heat related illnesses are the most common stress situation encountered by site workers. However, the potential for these life-threatening injuries is not limited to emergency situations. Records exist to document that personnel are just as susceptible to these stresses during drills and training sessions.

Most of the systematic studies that apply to heat stress and protective clothing are adaptations of military tests conducted from the 1940's to the 1960's. However, in 1990 the Biotherm Company conducted stress testing for FEMA. 20 firefighters were tested for psychological responses to each of 3 suits. The climactic conditions used during this study were:

Climactic Conditions	Degrees Celsius	Degrees Fahrenheit
Hot/dry	38.9-42.2	102-108
Hot/wet	30.0-33.8	86-93
Comfortable	21.1-27.2	70-81
Cold	5.7-7.2	42-45

Each firefighter wore one suit per day. The individuals' rectal temperature, heart rate, blood pressure, recovery rate and body weight were recorded. The inside garment temperature was determined and environmental parameters were measured. The test lasted 55 total minutes, with 45 minutes of exercise time—equivalent to 5.5-6.5 METs. Results showed that increases in all parameters were greatest during the hot/dry and hot/wet phases. Rectal temperatures exceeded NIOSH regulations in all cases (100.5 degrees F). Some heart rates exceeded maximum treadmill test values.

In determining workers who may be at risk for heat stress, it was found that those workers with low work capacities were more likely to develop high body temperatures than workers with high work capacities. This was determined by measuring maximum oxygen consumption

(VO_2 maximum) which is a measure of aerobic fitness. Some results of the aerobic fitness and heat stress studies were:

- Among workers with VO_2 maximums ≤2.5 L/min., 63% are heat intolerant.
- Workers with VO_2 maximums <2.5 L/min. had a 5% risk of heat stroke compared to only a 0.05% chance if their VO_2 maximum was >2.5 L/min.

Human beings are homiotherms. This means that they self-regulate their internal temperatures. This "body core" temperature—not the temperature at the skin surface—is what we have come to recognize as 98.6 degrees F (37± degrees C). This is an average temperature and very few individuals actually register 98.6 degrees F on a regular basis.

Body core temperature is maintained by a portion of the brain known as the hypothalamus, through what is known as the "set point." When core temperatures deviate too many degrees on either side of the set point the brain sets into motion certain physical reactions to counter the temperature change:

- Shunting blood to the core, along with muscle contractions (shivering) to raise internal temperatures, or,
- Shunting blood to the surface, along with sweating (evaporation) to lower internal temperatures.

These physical reactions are based upon standard thermodynamic laws: conduction, convection and radiation.

This heat balance equation is expressed as:

$$DT = \text{Met Heat} \pm \text{convection} \pm \text{radiation} \pm \text{conduction} - \text{evaporation}$$

(where DT = Deep Temperature and Met Heat = Metabolic Heat)

Metabolism

The human body produces metabolic heat through the process of converting food into cellular energy by oxidation. The energy of breaking down sugars, such as fructose and sucrose, results in the production of heat and light. This is the same by-product of any chemical change that you learned in weeks 1A and 1B. The metabolism of food is an efficient process. Only twenty percent of the energy converted in the metabolic process is usable by the body's cells. The other eighty percent ends up wasted as heat radiated from the body. This process is continuous, occurring even when the individual is at rest. The metabolic rate varies dependent upon food intake and physical activity. However, the base metabolism is fairly constant at 60-70 kilo-calories per hour (60-70 kcal/hr.). This basal metabolic rate is known as 1MET.

Measuring metabolic heat produced by the body is a difficult process because the device would have to account for all heat escaping from every point of the body, as well as any heat absorbed by body tissues. Using oxygen consumption as the base, a metabolic equivalent can be expressed as the use of 1 milliliter of oxygen per kilogram of body weight per minute of time:

$$1 \text{ MET} = 1 \text{ ml } O_2/\text{Kg/Min.}$$

This technique is used because of the ease of measuring oxygen consumption. In lay terms, it can be expressed through some common examples:

Activity	kcal/hour	METs
Walking 2.5 mph with a 58 lb. load	415	6
Standing and performing arm work	240	4
Standing still	35	0.5

Heat Exchange

Heat exchange is a subject that you are probably already familiar with. The terms conduction, convection, radiation and evaporation are common to the fire service. The metabolic process utilizes these same processes of exchange in the conversion of food energy. A quick review of the heat exchange modes is in order.

Conduction is the transfer of heat between two solids, or a solid and a liquid, that are in contact with one another. The dissipation of heat through conduction is minimal for emergency response personnel. This would typically only occur where the responder's body came into direct contact with the PPE suit material.

Radiation is the transfer of heat between two bodies that are not in direct contact with each other. This transfer occurs as electromagnetic waves that carry energy from an emitter (radiator), outward in all directions, to a receiver. An example of this is the heat radiated from asphalt on a hot day. Objects that emit electromagnetic energy greater than 39 degrees C (95 degrees F) are heat radiators to the human body. Color is another heat variable. Lighter colored objects or materials tend to reflect the majority of the electromagnetic energy that strikes them, while dark objects tend to absorb most of that energy. This means that while light colored PPE suits will absorb some radiated heat, they will absorb far less than the darker suits will.

Convection is the transfer of heat that does not involve a phase change. Simply stated, convection utilizes liquid or gaseous mediums, or masses, to transport heat energy to other objects. These liquid or gaseous masses pick up the heat and carry them on rising columns to other objects where they can be absorbed. An example of this would be cool air blowing against dry skin. This form of heat exchange is also of little use to responders wearing PPE because of the insulating properties of the suit. As responders exhale air into the suit, the suit expands, creating an air void that limits the transfer of heat (or cooling).

Evaporation is the transfer of heat using a phase change. This phase change utilizes heat carried by a liquid such as sweat. As air travels over this liquid, heat energy is absorbed by the air, through evaporation, and carried away from the body. Evaporation is the major process, set off by the brain "set point," for body cooling. PPE is utilized by responders because it is impermeable to the transfer of vapors. This same quality renders the garments totally ineffective to the transfer of heat away from the body by evaporation.

Physical Heat Responses

The combination of physical exertion and lack of cooling begins to raise the body's core temperature. As the internal temperature rises, the body starts various control functions to moderate this heat. Increasing amounts of blood are shunted from the core to the cutaneous layers of skin. Greater amounts of sweat are produced for evaporative cooling. The heart begins to pump faster and harder to move more volumes of heat to the surface.

The body begins to lose ground when the heat cannot be dissipated quickly enough. The internal heating process continues, building more heat that still cannot be dissipated by normal body mechanisms. Eventually, the thermal regulatory system is overwhelmed. The brain now exacerbates the cooling problem by greatly increasing the "set point," which severely diminishes any further amounts of sweat production. This condition marks total failure of thermoregulation by the body.

The circulatory system functions to deliver oxygen and fuel to the individual cells. Blood, carrying these essential nutrients, is delivered through a regional system of arteries, arterioles, capillaries and capillary beds. This network can be regulated by the brain to carry only the amount of nutrients needed by each area of the body. However, this system can also be overcome. When that happens it leads to a condition known as anaerobic metabolism. This is a condition where oxygen is no longer supplied in sufficient quantity to continue the metabolic process that converts food to energy and nutrients (amino acids, carbohydrates, etc.). Oxygen insufficiency cannot be continued indefinitely.

One example of this insufficiency is the build-up of lactic acid in the muscle tissues. Lactic acid is a by-product of muscular activity which can only be removed through oxidation. However, the metabolic processes of muscle activity preferentially use available oxygen to assist the muscles in work. Since there is insufficient oxygen during activity to oxidize both the acid and the muscle tissues, the acid begins to accumulate. The results are muscle cramps and physical pain, and can lead to blood acidosis—a potentially fatal condiction.

Additionally, all humans are exercise-limited by the cardiovascular system. When energy is no longer available from the ready nutrient sources; blood sugars and stored fats, the body will begin to go after other sources—muscles, then nerves, and then other tissues. The brain is in even worse shape since it cannot store oxygen or nutrients, and must have immediately available supplies of both.

The body's initial response to exercise is to increase the heart stroke volume (SV). This is the amount of blood produced by one beat of the heart. The second body response to exercise is to increase the heart rate (HR)—the number of beats. The identified safe maximum number of beats-per-minute for an individual is computed by the equation:

$$\text{Max. HR} = 220 - \text{age}$$

This increased stroke volume and heart rate can result in a cardiac output of 20-25 liters per minute:

$$\text{SV} \times \text{HR} = 20\text{-}25 \text{ L/min}$$

Typically, the average adult blood volume is about 3.2 liters. This blood is primarily composed of plasma and red blood cells. Blood also provides the fluid used in the production of sweat. Therefore, sweating begins to deplete the available blood volume as some of the fluid is converted for the sweating process.

Physical exertion provides another impact. Exercise begins a process in the body that leads to the dilation of the blood vessels. As the walls of the vessels begin to expand, the normal blood capacity can no longer fill the intervening space. The normal plasma volume is insufficient to circulate oxygen and nutrients to the various body areas that are in need. A simple rapid increase of only 5 or 10% dilation in the vascular system is sufficient to produce relative hypovolemia. When massive vasodilation occurs, such as often accompanies shock, blood volume resuscitation may require 15-25 liters, or more.

Heat Related Injuries

If the body's physiological processes fail to maintain a normal body temperature, and excessive heat is allowed to build up, a number of physical reactions can occur. These may range from mild (fatigue, irritability, anxiety, decreased concentration and dexterity) to fatal. Standard reference books should be consulted for specific treatment in these instances. Heat related injuries are the result of certain thermal disorders:

Heat Rash: Caused by continuous exposure to heat and humid air, and aggravated by chafing clothes. Heat rash decreases the ability to tolerate heat, as well as being a general nuisance.

Heat Cramps: Caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs of heat cramps include muscle spasms, and pain in the extremities and abdomen.

Heat Stress: The first manifestation of the body's thermoregulatory failure is heat stress. Typical signs and symptoms include fatigue, irrtation, altered mental state or level of consciousness, and dehydration. The body temperature is between 37-38 degrees C (98.6-100.4 degrees F).

Heat Exhaustion: The second manifestation of heat stress is heat exhaustion. It is caused by increased stress on various organs to meet increased demands to cool the body. While the body is still capable of producing sweat, a condition known as cardiovascular insufficiency is developing. This condition exists when the total available blood volume is no longer capable of fulfilling the vascular system's needs. Typical signs and symptoms include shallow breathing; flushed, cool, moist skin; profuse sweating; dizziness and lassitude. The body temperature is between 37.5-38.5 degrees C (99.5-101.3 degrees F).

Heat Stroke (Sunstroke): The final manifestation is heatstroke—commonly called "sunstroke." This is the catastrophic failure of the body's thermoregulatory system and is a true medical emergency that can rapidly result in the patient's death. The body must be cooled immediately to prevent severe injury and/or death. Signs and symptoms include red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; hypotension; coma. The body temperature is over 40.8 degrees C (104.9 degrees F).

Treatment of Heat Illnesses

Anyone who exhibits the signs or symptoms of a heat related illness requires immediate medical attention. These individuals should be removed to a shaded area and cooled by evaporative or active cooling methods. Intravenous therapy should be considered anytime that cardiovascular insufficiency is a factor in the patient's condition. For all heat related injuries, the following protocols should be adhered to:

- Maintain vital signs.
- Monitor patients.

Transport patient to the nearest medical facility, if appropriate.

Medical Monitoring

The need for medical monitoring guidelines is heightened by the pressures placed on emergency responders by their supervisors, peers, and their own individual motivations, to continue working even when it is no longer safe for them to do so. Fortunately, OSHA requirements specify medical monitoring as a component of the Site Safety Plan. This reduces the chances that individuals may exceed their physical limitations due to inappropriate motivations. However, we must also recognize that medical monitoring has certain implications. It may shorten the work time for each individual, which requires that additional trained responders be available to mitigate the same incident. Medical monitoring may also increase the time between entries, and increase the times needed for rehydration, rest periods and temperature recovery—again increasing the number of trained responders required. These two factors illustrate the need to better prioritize the objectives for personnel working in the various zones.

Pre-Entry and Post-Entry Assessments

Medical support and assessment is an important element of an effective Hazardous Materials response. Medical monitoring should be initiated both before entry into the Exclusion Zone, and after exiting. The Level II Responder is responsible for the execution of, or the supervision of, medical support for hazardous materials responders.

More important than the legal requirements for medical monitoring is the personal impact of monitoring on the individual. We already know that heat related illnesses (heat stress, heat exhaustion and heat stroke) are the number one health risk to emergency responders at hazardous materials incidents. Heat related illnesses are most prevalent during warm or hot weather. Monitoring vital signs provides the best method to prevent or identify these conditions. Obviously, the backbone of this program rests with assigning critical values that identify these symptoms before they become serious.

Monitoring procedures are not limited to field locations. 29 CFR 1910.120 designates two types of programs: baseline medical exams and field monitoring programs. Medical monitoring is a multi-faceted program that is predicated on the status of the individual:

- Employees who have hazardous materials incident response functions as a regular, expected function of their employment.
- Employees who *do not* have hazardous materials incident response functions as a regular, expected function of their employment.

Employees in the first category fall into the group of those who must have baseline medical examinations, as well as pre-entry and post-entry monitoring. Employees in the second group require pre-entry and post-entry monitoring only.

Baseline medical evaluations are conducted under the guidance of a physician and are done biennially, annually, or prior to response. Pre-entry physicals are routinely conducted by field EMS personnel who should be assigned exclusively to this duty at the scene and answer directly to the site safety officer only. Post-entry screening applies the monitoring guidelines, as suggested in this chapter, to assess physical status at the scene (see Medical Monitoring Position Description).

Emergency response personnel must establish a medical monitoring station at each hazardous materials incident. The medical monitoring site should be located near the "dress out" area for the Entry and Decontamination Team personnel. If possible, this should be in a cool, shaded location away from noise and other distractions.

All pre-entry and post-entry vitals that are taken must be documented. Therefore, agencies should establish some sort of record keeping system to document these vitals.

Elements of an Effective Medical Monitoring Program

Advances in medical science have altered our understanding of what constitutes heat illnesses and what their more accurate indicators are. Previously, we held the belief that the best indicators for measuring heat distress were accomplished by assessing the patient's temperature, heart rate and blood pressure. We now accept that a more accurate assessment is gained by measuring the patient's body core temperature, heart rate and water weight loss. Therefore, an effective medical monitoring program should include assessments of these essential factors.

Body weight: It is possible for individuals to have a sweat rate as high as 3.5 liters per hour when they are wearing chemical protective clothing. Fluid loss is an element of heat stress management that cannot be made up quickly. Fluid metabolism is a slow process that must occur throughout the day to be truly effective. A good rule of thumb for fluid replacement is to administer the equivalent amount of fluid weight as was lost through the incident activity. When considering the administration of fluids, do not rely on the patient's thirst level alone. This is a deceptive indicator. A more accurate indicator is deeply yellow colored urine. However, false indicators from certain vitamins and various foods can also create this condition. Don't guess. Rely on measurable indices: body weight loss using a scale accurate to within 1/4 of a pound.

Suggested water weight loss parameters are:

- Body weight loss should not be allowed to exceed 1.5% of total body weight.
- A 3% loss of body weight should require that the individual be immediately removed from all duties pending a thorough assessment by a qualified medical authority.
- A 5% loss of body weight should require that the individual be immediately transported to the nearest medical facility for a thorough assessment.

Be cautious when taking the post-entry body weights. Post-entry assessment is intended to weigh the amount of fluid remaining in the body tissues. Weighing individuals who have rehydrated

or are still in sweat soaked garments defeats the purpose of the measurement. Pools of liquid in the stomach or hanging on the body serve no immediate value and may mask a serious condition. Make sure the post-entry weight is a "dry" one.

Body temperature: The most common of body temperature assessment is the oral thermometer, but oral temperatures are not accurate enough to rely on for determining patient well-being. The second option is hardly practical in the field. Even though rectal temperatures are the most representative deep core temperature indicator, few responders would consider them to be practical at a hazardous materials site. The third option provides the best solution. Tympanic temperature readings (taken through the ear drum) are a good indicator of body core temperatures and are relatively easy to acquire.

The best method of accurately determining an individual's temperature rise is by establishing a baseline prior to the event. This is accomplished by measuring the temperature every day over a two week period. However, this is not always an easy task to accomplish. Again, some guidelines can be utilized.

- A maximum rise in temperature should not exceed 1.5 degrees Fahrenheit upon post-entry examination.
- No personnel should be permitted to continue working until their temperatures return to within 0.5 degrees of normal.
- To be valid, the temperature must be acquired as quickly as possible after the individual has exited the work zones.

Pulse or heart rate: The pulse is the best indicator of the overall stress being applied to the body. It is a direct measurement of how fast the body is attempting to cool itself, and it indicates the aerobic exercise recently generated by the individual. The most widely accepted pulse measurement is known as the *"Age Adjusted Maximum Heart Rate."* This figure represents the limit to which an individual can maintain aerobic exercise for extended periods without damaging the heart muscles. However, this number should never be exceeded by personnel. To figure the Age Adjusted Heart Rate, subtract the individual's age from the number 220.

$$220 - \text{age} = \text{Adjusted Heart Rate}$$

Blood pressure: This is a health component that is not believed to be affected by heat stress, and does not require constant monitoring. However, it is a measurement of the "quality" of rest by the heart muscle between each stroke and is worth tracking.

General health: Is an overall indicator of the responders' fitness for stressful working environments. This includes general physical appearance and identification of personnel who haven't been feeling well lately.

Neurological status: Can be an early indicator of stress and/or exposure.

Electrocardiograph strip: These devices are rarely available in the field, but they are a good, qualitative baseline when they are.

Fluid Replacement, Rest and Recuperation Guidelines

The Medical Monitoring plan must address every factor pertinent to the full recovery and return-to-work of all personnel. These factors include: fluid replacement, rest, and heart recovery.

Water is the best fluid replacement. Sweetened drinks tend to inhibit the metabolic process that restores water to the cells, as does carbonation. However, personnel should be allowed to drink something that they like. Fruit juices and electrolyte solutions should be diluted with water prior to consumption. This will improve the body's ability to assimilate these liquids. Alcohol and caffeinated drinks should never be permitted because they actually promote dehydration, as do salt tablets. Additionally, drinks that are cooled to between 50-60 degrees better facilitate the absorption of water by the body.

The medical monitoring plan may use a variety of methods to determine rest and recuperation periods. As an example, aerobically fit personnel, working under normal conditions for twenty minutes should rest as per the following:

Ambient Air Tempertaure	Rest Period
<70 degrees F	30 minutes
70-85 degrees F	45 minutes
>85 degrees F	60 minutes

Recommended work durations, between rest periods, for personnel wearing CPC is covered by the Occupational Safety and Health Guidance manual for Hazardous Waste Site activity in Table 8-10. (Refer to the Work Duration Form on page 000). However, minimum recovery guidelines must be utilized to determine when personnel have returned to a condition where they may wear CPC and return to a work zone again. The minimum suggested health guidelines are:

Vital Sign	Minimum Guideline
Temperature	A return to within .5 degrees of normal
Body Weight	A return to within 1.5% of normal
Pulse	A return to within 5%, and
	<90 beats per minute
Blood Pressure	<150/90

These guidelines may be amended, deleted, or added to based upon the guidance of your Team physician.

Guidelines for Removing Workers

A responder manifesting any one of the following signs should be removed from work. Responders removed from work due to these medical signs are not allowed to return to work until cleared by a qualified medical authority:

Vital Sign	Point at Which Responders Should Be Removed from Work
Body Temperature	>38 degrees C (100.4 degrees F)—This is an OSHA requirement
Pulse	>85% of the maximum heart rate (Maximum 22–age)
	>110 beats per minute while the individual is at rest
Heart rate recovery	<10 beats per minute*
Body weight loss	>3%
Other	Other signs and symptoms of heat related illness such as skin temperture and cardiac rhythms

*Heart rate recovery is measured by taking the first and third minute pulse rates immediately upon exiting the work zone and then determining the difference. It is stated as:

(Heart rate recovery = 1 minute rate – 3 minute rate)

Personal Exposure Records

29 CFR 1910.120 requires personal exposure records for all personnel working at a hazardous waste site. By definition, a hazardous materials incident is a hazardous waste site. This requirement covers all employees who were exposed to, or were potentially exposed to, hazardous materials. This regulation requires the employer to document exposures in the employee's records and maintain those files for thirty years beyond the last day of the individual's employment. However, records do get lost or accidentally destroyed. Therefore, it is essential that the employees maintain their own copies of the file. Otherwise, it may be very difficult to prove occupational exposures in the future.

Summary

The encapsulating suit may be the most dangerous environment encountered at a hazardous materials incident. Monitoring of emergency response personnel needs to be improved as air times and entry times increase. Some parameters can be modified to improve personnel safety. Remember that the risk of heat stress is proportional to the aerobic fitness of the worker. Consider improving the Fit(ness) of the responder, rather than improving the fit of the suit to the responder. Account for those conditions that cannot be modified and always provide for safety first.

Heat related illnesses are the number one cause of injuries to hazardous materials emergency responders. Limiting the occurrence of these injuries is dependent upon controlling the physical processes that lead to them. Prevention begins with awareness and ends with preparation. Preparation must be an on-going process for each responder before the incident occurs, while awareness of these hazards will help the responder to travel safely through the incident.

Medical monitoring of responders is important, not just because it is required. Establish an SOP for medical monitoring for your agency. Ask for guidance from your team physician. And, if you do commit errors, make them on the side of safety. Don't forget to provide EMS personnel with information on the signs and symptoms of exposure to the site chemicals as soon as they become available.

Study Questions

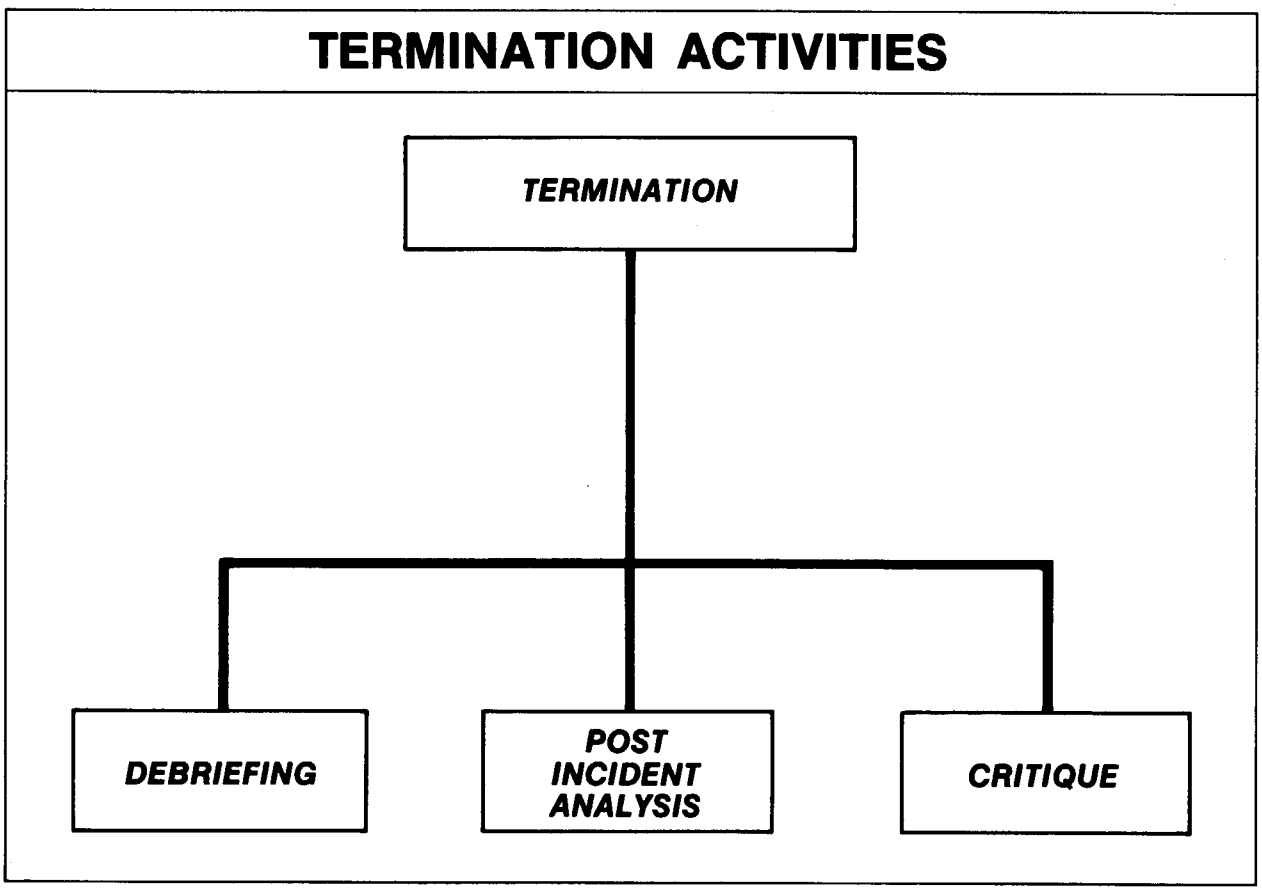
- Describe the four types of stresses encountered when wearing CPC?
- What factors make personnel susceptible to heat related illnesses or other injuries?
- How does wearing CPC impact work tolerance?
- How may cold exposure affect emergency response personnel?
- How is a Work Mission Duration form used to protect response personnel?
- What two factors should be considered when modifying work duration?
- Describe the ways in which the body responds to changes in core temperature.
- Describe the four types of heat related illness, and the signs and symptoms associated with each.
- What is the appropriate treatment for heat related illnesses?
- What are the components of a medical monitoring plan?
- What is the best indicator of overall stress on the body?
- Why shouldn't substances containing salt, alcohol or caffeine be given to personnel?
- What are the guidelines for removing personnel from work?
- How long must employers maintain personal exposure records?

Module 3

MEDICAL OPERATIONS AND TACTICS

Section 7

POST INCIDENT



An effective debriefing should:

- Inform responders exactly what hazmats they were exposed to.
- Identify equipment damage and unsafe conditions requiring attention.
- Assign information, gathering responsibilities for post-incident analysis and critique.
- Summarize the activities performed.
- Reinforce the positive aspects of the response.

Post-incident analysis is conducted to:

- Determine the level of financial responsibility.
- Establish a clear picture of the emergency response for further study.

The post-incident analysis should focus on four key topics:

Command and control

Tactical operations

Resources

Support services

Critiques

Many injuries and fatalities have been prevented as a result of critique sessions. A commitment to critique all haz mat responses will improve emergency responder performance by improving efficiency and pinpointing weaknesses.

The crucial person to a good critique is the critique leader; the critique leader should:

- Control the critique.
- Ensure that direct questions receive direct answers.
- Ensure that all participants play by the critique rules.
- Ensure that each operational group presents their observations.
- Keep notes of important points.
- Sum up the lessons learned.

SUMMARY

Hazardous materials incidents should be formally terminated to ensure emergency responder safety, to establish a record of events, and to document the lessons learned from the entire incident.

Vehicle Cleanup

The response vehicle and equipment must be decontaminated according to the established policies of environmental agencies and industry experts. (Some equipment will be discarded rather than decontaminated. Contact CHEMTREC or DEPE for specific decontamination procedures.) Decontamination MUST occur prior to the response vehicle returning to service if the vehicle was contaminated.

The possibility of returning to the scene to transport additional patients prior to the ambulance's decontamination must be assessed, based on the hazardous material involved and the level of contamination.

Review Session

Hold an immediate EMS review session to cover the following topics:

- Assess need for a Critical Incident Stress Debriefing.
- Areas of strongest performance.
- Areas needing additional work.
- Additional personnel and equipment needed next time.
- Items transported which were unnecessary.
- Restocking requirements.

Hospital personnel should also have a post-event evaluation considering most of the list above. In addition, hospitals must be concerned with the effect of the hazard (if any) on the public, staff and other patients in the hospital, the security of the contaminated vehicles which must be parked in public places, the efficiency of specialized lab services and the adequacy of equipment, staff and facility.

Shutting Down the DECON Area

At the conclusion of the decon process, it is important that the decon area itself be decontaminated to prevent the spread of any contaminated material.

- Clean up is to be done by **Decon Team** in **PPE.**
- All solid waste, that is to be contaminated, is to be collected and placed in a "Contamination Bag."

  If it is determined to be a hazard, it will be disposed of by a hazardous waste company.
- Waste water is to be held as follows:
  - if it is determined not to be hazardous, it can be disposed of in the sewer system.
  - if hazardous, the waste water must be sealed in drums and arrangements made for pick up by a hazardous waste disposal company.
  - The **Chemical Safety Officer** will make these determinations and arrangements.
- The entire decon area is to be straightened up and cleaned down.
- All supplies and decon equipment is to be properly put away. Inventory is to be taken as to what is to be needed.
- Haz Mat supplies are to be relocated to storage area.

Module 4

EXERCISES

Student Exercise A

You have just responded with the initial response of an EMS Response Team to a very chaotic haz mat incident. It's your turn to take over. Step into their shoes.

You are soon to receive patients from the haz mat team on the scene. Are you read?

- Where are you?
- Where have you set up your triage?
- Do you know yet where the zones are?
- How have you conducted your reconnoiter of the area?

What is your level of preparation to receive the patients?

- What protective clothes do you have on?
- What supplies do you have on hand for secondary decontamination?
- What disposable equipment and supplies do you have?
- What equipment can you commit that can be decontaminated?
- What kinds of gloves are you wearing?
- What reference books do you have available in triage?

How are you interacting with other emergency personnel on the scene as time goes on?

- What is your interaction with the firefighters?
- What support do you give the haz mat team, the firefighters, the police?
- How do you handle arrangements for back-up?
- When do you call in back-up and how is that call made?
- How do you arrange for transport of a potentially contaminated person?
- As the hours drag on and the haz mat team and other personnel are still working but you are just waiting, how do you stay primed to respond?

Student Exercise B

Please read the following scenarios.* After you have read the available size-up and other information, discuss in each case:

- How would you prepare to respond?
- What special concerns would you have?
- What can happen if you rush in and are not prepared?
- What can happen if you take the ASAP approach?
- What would tempt you not to follow the ASAP approach?
- What would motivate you to follow the ASAP approach?

For each specific scenario, also consider:

- What is the safest approach?
- Where should EMS Responders be located on the scene?
- How do you determine the physical condition of the people involved in the incident?
- How do you get a manifest or other information on the product?
- What would be your primary treatment and how would it be determined?
- What information should be relayed to other responding services?

*You will need multiple copies of this worksheet to jot down your notes on each case.

SCENARIO #1

You are dispatched to a transportation incident on Main Street. It is 1700 hours and weather conditions are partially cloudy, air temperature of 80 degrees F, with humidity of 75%.

When you arrive on the scene, you hear this scenario:

A tractor trailer had stopped for a red light on Main Street. The truck was placarded "Dangerous" on all four sides. A municipal police car pulled up behind the truck and noticed the truck was leaking a fluid out of the rear and floor of the truck. The officer turned on his overhead lights and, via his PA system, hailed the driver to pull to the side and turn off his truck. Then the officer approached the driver in the cab. The officer and the driver got the truck's shipping papers and moved up-wind of the trailer to review it. In doing so, they walked through a developing vapor cloud and a pool of liquid created by the leak. They smelled a strong irritating odor. Upon reaching the up-wind area, each man experienced minor respiratory distress.

The truck driver gives you a copy of several pick-up tickets. The incident had occurred as he was returning to his terminal. He was carrying a consolidated cargo. The pick-up tickets indicate the commodities involved were consumer goods. The load includes:

Calcium Hypochlorite Mixtures	1 pallet	DOT 2208
Carbonated Beverages	4 pallets	
Ammonia Solution	1 55-gal. drum	DOT 2672
Chlorine	3 x 1-gal. liquid	DOT 1017
Adhesives		DOT 1133

What are your actions?

SCENARIO #2

You are dispatched to a one-family home. The nature of the call: a woman is in respiratory distress. Upon your arrival, you find the door being opened by an eight-year-old boy. He called for the ambulance after finding his mother gasping on the floor in the bathroom. The child cannot provide you with any medical history. He does not relate to you that his mom was cleaning the bathroom.

You follow him toward the bathroom. Your observations of the scene include . . . a woman, mid-thirties in severe respiratory distress in the hallway. The bathroom has one small window which is closed. The radiator is providing more than adequate heat. In the tub is a sponge. Alongside the tub are several containers of cleaning products, including ammonia and bleach. The odor in the bathroom is unpleasant. The woman has no obvious injuries.

What are your actions?

SCENARIO #3

You are dispatched to a local home improvement store for an unknown medical call. You are directed to a loading area in the rear of the building. An employee takes you to the storage area where a stock clerk, later teens, is lying on the floor in a puddle. While stacking cases of extra supplies, the fork lift he was operating skidded into a stack of cases containing pool chemicals. The cases are marked with yellow labels. There is a strong irritating odor in the area.

Apparently, he fell from the fork lift to the floor, sustaining an obvious open fracture to his right forearm and a possible fractured left ankle. He is conscious but dazed.

What are your actions?

SCENARIO #4

You are dispatched to a local chemical company for a man injured. Upon your arrival, you are met by a security officer who directs you to the chief maintenance officer. It seems that one of his men fell into an empty cargo tank truck while cleaning the vehicle. He is unconscious and bleeding severely from several lacerations received as he slipped and fell into the tank, approximately 6 feet.

The maintenance officer states that the tanker was in for cleaning. The placards and other markings indicating the type of chemical involved have been removed.

What are your actions?

Module 5

COURSE REVIEW

Synopsis

Here is a synopsis of the key points covered in this course.

What's Happened?

Without warning, hazardous materials incidents can occur:

- on roads and highways (in trucks, vans, and cars),
- on railways (in transport and on site),
- at fixed facilities (plants, factories, office buildings, warehouses),
- in stores (garden centers, supermarkets),
- in public facilities (schools, community pools),
- in homes, garages, farms and barns.

What Do You Do?

Before you respond to any incident that could possibly involve hazardous materials, you need to ask yourself:

yes	no	
☐	☐	Do I have the training?
☐	☐	Do we have protective clothing and appropriate equipment?
☐	☐	Do we have a plan that clearly identifies our role at the scene?
☐	☐	Do we have agreements with area hospitals to treat victims of hazardous materials incidents?

Minimum Preparation Required of EMS Responders to Haz Mat Incidents:

The approach to a potential hazardous materials incident demands that you be prepared regarding:

Training—EMS personnel must be trained to the operational level according to NJ PEOSHA.

Protective Gear—Minimum protective clothing and eye protection EMS Responders need.

Role in the Local Emergency Operating Plan—Knowledge of local emergency operating plan, EMS role and standard operating procedures.

Size-up—Training in how to size up an incident that may potentially involve hazardous materials.

Patient Care—Training in the special handling, care and transport of and supplies for a patient who has possibly been exposed or contaminated.

Incident Command System—Basic knowledge of the incident management system operating at a scene.

Review of zones at an incident:

Emergency workers often use the EPA-designated titles for the zones at a suspected hazardous materials incident:

- Hot zone—area of incident and contamination;
- Warm zone—decontamination reduction corridor;
- Cold zone—area for triage and transport.

Please note: The EPA and the National Fire Protection Association (NFPA) have similar but different names for the zones.

The level of protective gear needed in each zone is dictated by the material involved, proximity to the incident and roles of the responders working in those areas. All workers need to be appropriately attired. Here's a review of the levels of protection required in the different zones:

Level A—for people who need the highest level of eye, skin and respiratory protection—Haz Mat teams, for example, who work in Hot Zone:

—HAZ MAT FULLY ENCAPSULATED SUIT, SCBA OR AIR LINE WITH ESCAPE BOTTLE, CHEMICALLY RESISTANT GLOVES AND BOOTS, AND TWO-WAY INTRINSICALLY SAFE RADIO

Level B—for people who need the highest level of respiratory protection but lesser skin protection—haz mat team members, for instance, who work in the Hot Zone.

—SCBA CHEMICALLY RESISTANT SPLASH SUIT, 2 PAIRS OF CHEMICALLY RESISTANT GLOVES, BOOTS AND COVERS, HARD HAT, TWO-WAY INTRINSICALLY SAFE RADIO

Level C—for situations when the responders need an air purifying respirator and chemical resistant skin protection for work in Warm Zone, for example.

—FULL-FACE AIR PURIFYING RESPIRATOR, CHEMICAL RESISTANT COVERALL, 2 PAIRS OF CHEMICAL RESISTANT GLOVES, BOOTS AND COVERS, HARD HAT, ESCAPE MASK, TWO-WAY INTRINSICALLY SAFE RADIO. AIR PURIFYING RESPIRATORS CAN BE USED ONLY WHEN THE CONTAMINANTS AND CONCENTRATIONS ARE KNOWN.

Level D—for those working in an area with no contamination or a low threat of exposure to hazardous materials . . . In most cases, EMS Responders work in the Cold Zone of an incident.

—SPLASH SUIT, CHEMICAL RESISTANT BOOTS, HAZARD GLOVES, & SPLASH SHIELD OR, giving less protection, an EMS JUMPSUIT.

Role of First EMS Responder

The first EMS Responder on the scene serves as the EMS Branch Director until relieved of that responsibility. Duties involve:

- Preliminary assessment.
- Notification of hospital of patient injuries, status and contamination.

- Relay of information of hazardous materials involved (including spelling, phonetic spelling and any other information available) both to the EMS personnel on the scene and to the ER personnel at the receiving hospital.
- Request for appropriate arrival and patient drop-off at hospital or other medical facility (a location preferably isolated from other patients to avoid possibility of cross-contamination).
- Staying at the command post until relieved of that duty.
- Delegating responsibility for triage, if needed.

Considerations for Triage

Patients involved in haz mat incidents often end up wet and cold from the hose down they received in the Warm Zone. When you receive them, where will you be bringing them?

In determining the proper area for triage, you should have considered in advance:

- ✔ Is this a good place for triage?
- ✔ Will we be out of harm's way?
- ✔ Is it upwind?
- ✔ Is it dry?
- ✔ Is it out of the weather?
- ✔ Will it block access to the scene?
- ✔ Can rigs get in and out easily?
- ✔ Where can we get information to help in our assessment of the situation?

Considerations for Transportation

Contaminated patients should be decontaminated at the scene. If you must transport contaminated patients, you need to:

- ✔ Communicate with the hospital.
- ✔ Confirm hospital preparedness to receive patients.
- ✔ Relay information on patient condition and care.
- ✔ Relay information on hazardous material involved.
- ✔ Request the delivery location. (Note: this may be other than the emergency room to avoid possible contamination of ER.)

After the Haz Mat Incident

- Decontaminate rig at incident site.
- Bag and dispose of contaminated clothing and other items at the incident site.
- Decontaminate equipment as soon as possible.
- Bring in Critical Incident Stress Debriefing team to assist squad members in handling emotional aftermath of especially stressful incidents.
- Assess performance and recommend any changes in procedures.
- Replenish depleted supplies.

Module 6

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REFERENCES

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Module 7

GLOSSARY

GLOSSARY

-A-

29 CFR 1910.120—Hazardous Waste Operations and Emergency Response (OSHA)

A-310—(Public Law 1984, Ch. 210) Inter-Agency Notification

ABSORBANT MATERIAL—Loose or bagged material like commercial bagged clay, kitty litter, Zorbal, or "pigs" used to soak up liquid hazardous materials.

ACGIH—American Conference of Governmental Industrial Hygienists. Recommends upper limits (TLVs) for exposure to workplace chemicals.

AIR REACTIVE MATERIALS—Materials that will react with atmospheric moisture and rapidly decompose.

ANSI—American National Standards Institute

APR—Air Purifying Respirator

ASPHYXIANT—A substance that can cause unconsciousness or death by lowering the concentration of oxygen in the air by out competing oxygen metabolically in the body.

AST—Above Ground Storage Tank

-B-

BER—Bureau of Emergency Response (of DEPE)

BLEVE—Boiling, Liquid Expanding Vapor Explosion

BPU—Board of Public Utilities (now the BRC)

BRC—Board of Regulatory Commissioners (formerly the BPU)

BULK PACKAGING—Packaging other than a vessel or barge in which materials are loaded with no intermediate form of containment. It includes transport vehicles and freight containers which have an internal volume greater than 450 Liters (118.9 gallons) for liquids, 400 Kilograms (881.8 pounds) for solids, or a water capacity greater than 453.6 Kilograms (1000 pounds) for gas.

BUNG—1) The cap or plug used to seal the small opening in the top of a drum or barrel. 2) The small opening in the top of a drum or barrel.

-C-

CAA—Clean Air Act

CARCINOGEN—A substance that causes cancer.

CARGO TANK—Bulk packaging which is a tank intended for carrying liquids or gases, is attached to a motor vehicle or not detached for unloading, and is not fabricated under other specifications (as for cylinders, portable tanks, tank cars, etc.).

CAS—Chemical Abstract Service

CEHA—County Environmental Health Act

CEPP—Chemical Emergency Preparedness Program

CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act (the Superfund Law)

CFR—Code of Federal Regulations

CGI—Combustible Gas Indicator

CHEMTREC—Chemical Transportation Emergency Center

COCARCINOGEN—(or promoter)—Not a carcinogen by itself, but promotes the effects of a carcinogen.

COMBUSTIBLE SUBSTANCE—A solid, liquid, or gas that will burn.

CONFINED SPACE—A space which, by design, has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, could contain a hazardous atmosphere and which is not intended for continuous employee occupancy. A confined space includes (but is not limited to) a tank, vessel, pit, ventilation duct work, vat, boiler, sewer, or underground utility vault. (NJAC 12:100-9.2).

CONSUMER COMMODITY—A material that is packaged and distributed in a form intended for sale through retail agencies from consumption by individuals for purposes of personal care or household use.

CONTAINMENT—The act of preventing or confining the spread, for further spread, of a hazardous material.

CRYOGENIC—Pertaining to materials at extreme low temperatures (below -90 degrees C or -130 degrees F).

CWA—Clean Water Act

CYLINDER—A pressure vessel designed for pressures above 40 psia and having a circular cross section.

-D-

DECOMPOSITION—The basic breakdown of a substance into different substances. Energy will be released by this reaction; in the case of highly reactive materials, the release may be sudden i.e. explosive.

DECONTAMINATION—The process of removing hazardous substances to prevent adverse health, safety, or environmental effects. Takes place at three levels based on exposure.

DEGRADATION—(applied to protective clothing) Chemical decomposition brought about by exposure to heat, sunlight, solvents, or oxidation.

DEPE—Department of Enviromental Protection and Energy

DOE—Department Of Energy

DOH—Department Of Health

DOL—Department Of Labor

DOP/HRDI—Department of Personnel/Human Resource Development Institute

DOT—Department of Transportation

DOWNWIND—The area directly in the path of the wind from the incident site.

DPW—Department of Public Works

-E-

ECRA—New Jersey Environmental Cleanup Responsibility Act

EFFLUENT—Waste material (such as smoke, liquid industrial refuse, or sewage) discharge into the environment. It generally refers to water pollution.

EIS—Emergency Information System

EMS—Emergency Medical Service

EOC—Emergency Operations Center

EPA—United States Environmental Protection Agency

ERG—USDOT Emergency Response Guidebook

ERP—Emergency Response Plan

EXPLOSIVE LIMITS—The range of concentration of a gas or vapor (measured in percent by volume in air) that can explode upon ignition in a confined space. The highest and lowest concentration are called, respectively, the Upper Explosive Limit (**UEL**) and the Lower Explosive Limit (**LEL**). At concentrations lower than the LEL, there is not enough product in the air to explode; the mixture is "too lean". At concentrations above the UEL, there is not enough oxygen to sustain an explosion; the mixture is "too rich".

EXPLOSIVE RANGE—The number (as a percentage) that results from subtracting the LEL of a substance from its UEL.

-F-

FEMA—Federal Emergency Management Agency

FLAMMABLE SUBSTANCE—A solid, liquid, vapor, or gas that will ignite easily and burn rapidly.

FLASH POINT (FP)—The lowest temperature at which the vapor given off by a liquid within a test vessel forms an ignitable mixture with air. This is *only* a flash, not a sustained fire.

FR—Federal Register

FRA—First Responder Awareness

FREEZING POINT—The freezing point or melting point of a substance is the temperature at which its crystals are at equilibrium with its liquid state. The terms melting point and freezing point are used interchangeably, depending on whether that temperature is approached by heating or cooling the substance.

FREIGHT CONTAINER—A reusable container having a volume of 64 cubic feet or more. It is designed and constructed to permit lifting with its contents intact.

FRO—First Responder Operational

FUMES—The particulate, smoke-like emanation from the surface of heated metals. Also, the vapor from concentrated acids, evaporating solvents, or as a result of combustion or other decomposition reaction.

-H-

HAZARDOUS MATERIAL—Any substance that, when released from its container, is a potential or actual threat to the safety of life or property when it touches or impinges upon them.

HAZARDOUS MATERIAL INCIDENT—The unintentional or uncontrolled release of a hazardous material.

Level I: contamination is likely but unknown.

Level II: contamination is known to have occurred but skin contact or irritation is not evident.

Level III: contamination is known to have occurred and skin contact or irritation is evident.

HAZARDOUS WASTE—Any substance that may pose an unreasonable risk to health, safety, or property when transported in commerce for the purpose of treatment, storage, or disposal as waste.

HAZMAT—Hazardous Materials

HAZWOPER—Hazardous Waste Operations and Emergency Response

HMERP—New Jersey State Police Hazardous Materials Emergency Response Planning Unit

HMT—Hazmat Technician

HSFS—Hazardous Substance Fact Sheet (NJDOH publication)

-I-

IC—Incident Commander

ICS—Incident Command System

IDLH—Immediately Dangerous to Life and Health

IGNITION TEMPERATURE (Ign. Temp.)—The minimum temperature required to initiate sustained self-combustion of a material or compound.

-L-

LEL—Lower Explosive Limit

LEPC—Local Emergency Planning Committee

-M-

MISCIBILITY—The ability of a liquid or gas to dissolve completely and evenly in another liquid or gas at any concentration.

MSDS—Material Safety Data Sheet

MSHA—Mine Safety and Health Administration

MUTAGEN—A substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

-N-

N.O.S.—Not Otherwise Specified.

NFPA—National Fire Protection Association

NIEHS—National Institute of Environmental Health Sciences

NIOSH—National Institute for Occupational Safety and Health

NJAC—New Jersey Administrative Code

NJPDES—New Jersey Pollutant Discharge Elimination System

NJRTK—New Jersey Right To Know law (also called Worker and Community Right To Know)

NJSA—New Jersey Statutes Annotated

NJSP—New Jersey State Police

NON-BULK PACKAGING—(see bulk packaging) Packaging smaller than bulk packaging.

NON-LIQUIFIED GAS—Under pressure, is entirely in the gaseous state at 21.1°C (70°F).

-O-

OEM—Office of Emergency Management

ORM—Other Regulated Material.

OSHA—Occupational Safety and Health Administration

OSIC—On Scene Incident Commander

OVERPACK—An enclosure used by a consignor to provide protection or convenience in handling a package or to consolidate two or more packages. It does not include a freight container.

-P-

PEL—Permissible Exposure Limit

PENETRATION—1) Refers to chemicals physically passing through protective clothing by way of a tear, cut, or improperly sealed closure. 2) Introducing contaminants into the body by way of exposed cuts or injection by sharp materials (broken glass, metal shards, etc.).

PEOSHA—Public Employee Occupational Safety and Health Act

PERMEATION—Refers to chemicals passing through protective clothing by absorption. **All** protective clothing is permeable to some extent.

PILE—Any non-containerized accumulation of solid, nonflowing hazardous wastes that is used for treatment or storage.

PLUME—A vapor cloud formation which has shape and buoyancy.

POINT SOURCE—Any discernible, confined, and discrete conveyance (pipe, ditch, channel, conduit, well, etc.) from which pollutants are, or may be, discharged.

POISON—Any substance that is harmful to living tissue when applied in relatively small doses. (See toxin).

PORTABLE TANK—A bulk packaging designed to be loaded onto or temporarily attached to a transport vehicle or ship.

PPE—Personal Protective Equipment

PULMONARY EDEMA—The condition of having fluid in the lungs. The condition may be fatal.

-R-

RCRA—Resource Conservation and Recovery Act

REACTIVE SUBSTANCE—A solid, liquid, or gas that can cause an explosion under certain conditions or on contact with other specific substances.

RESIDUE—The hazardous material that remains in a packaging after its contents have been unloaded to the maximum extent practicable and before the packaging is refilled or cleaned and purged to remove any hazardous vapors.

RTK—Right To Know; May refer to State or Federal law

-S-

SARA—Superfund Amendments and Reauthorization Act of 1986

SCBA—Self-Contained Breathing Apparatus

SHIPPING PAPER—A shipping order, bill of lading, manifest or other document containing the information required by 172.202, 172.203 and 172.204.

SOLUBILITY—The ability or tendency of one substance to dissolve evenly in another.

SOLVENT—A substance capable of dissolving another substance (the solute) to form a uniformly dispersed mixture (the solution). Water, referred to as the "universal solvent", is a strongly polar solvent.

SOP—**S**tandard **O**perating **P**rocedure

SPONTANEOUSLY COMBUSTIBLE—The ignition of a substance from the rapid oxidation of its own constituents.

STCC—**S**tandard **T**ransportation **C**ommodity **C**ode

STEL—**S**hort **T**erm **E**xposure **L**imit

STLC—**S**hort **T**erm **L**ethal **C**oncentration

SUMP—Lowest point of a tank. The emergency valve or outlet valve is usually attached to a tank's sump.

-T-

TCPA—**T**oxic **C**atastrophe **P**revention **A**ct

TERATOGEN—A substance that causes birth defects by damaging a fetus.

TLV—**T**hreshold **L**imit **V**alue—recommended air concentration in which most persons can work for an 8-hour work day without ill effects. Set by the ACGIH.

TLV-C—**T**hreshold **L**imit **V**alue—**C**eiling—Exposure level to employees that shall not be exceeded during any part of the work day.

TLV-STEL—See STEL

TOXICITY—The state or degree of being poisonous; a harmful effect on biological mechanisms.

TOXIN—Anything harmful, destructive, or poisonous to the body (adj. Toxic). (See Poison).

TSCA—**T**oxic **S**ubstances **C**ontrol **A**ct

TWA—**T**ime **W**eighted **A**verage—The calculated average concentration for an 8-hour work day, 10-hour work day or 40-hour work week to which workers may be exposed over their working career without ill effects. Set by the ACGIH.

-U-

UMDNJ—**U**niversity of **M**edicine and **D**entistry of **N**ew **J**ersey

UNIT LOAD DEVICE—Any type of freight container with a net or aircraft pallet with a net over an igloo.

UNSTABLE MATERIALS—Those which, in the pure state, will vigorously polymerize, decompose, condense, or become self reactive, and undergo other violent chemical changes.

UPWIND—The direction from which the wind is coming.

UST—**U**nderground **S**torage **T**ank

-V-

VAPOR—An air dispersion of molecules of a substance that is liquid or solid in its normal state (room temperature).

VOC—**V**olatile **O**rganic **C**ompound

VOLATILITY—The tendency of a solid or liquid to pass into the gaseous state at a given temperature.

-W-

WATER REACTIVE MATERIALS—Materials which will violently decompose and/or burn vigorously when they come in contact with water.

WATER SOLUBILITY—The degree to which a material, or its vapors, are soluble in water. Materials that are completely soluble in water are said to be **miscible.**

HAZ-MAT
CHECKLIST

MEDICAL GROUP
MEDICAL OFFICER

STANDARD OPERATING PROCEDURES

A. GENERAL INFORMATION

1. The Medical Officer shall be assigned by the Haz Mat Officer.
2. MEDICAL shall assume the responsibility for treatment of the sick and injured, medical monitoring, and evaluation of entry team members.

B. MEDICAL FUNCTIONS

1. Gather all pertinent data on signs and symptoms of chemical exposure through the Haz Mat Officer and Safety Officer.
2. Treat all victims for any illness or injury.
3. Monitor emergency workers for exposure, heat stress and other medical problems.
4. Perform medical evaluations on all entry team members prior to and after entry and dispatch those requiring additional attention to the planned medical facility.
5. Provide aid to the Rest & Rehabilitation Area.

C. MEDICAL RESOURCES

1. Appropriate reference material
2. Appropriate protective clothing
3. Medical supplies

MEDICAL CHECKLIST

Date: _____ Time: _____ AM/PM

Location: _____

Haz Mat Officer: _____ Site Safety Officer: _____

Haz Mat Safety Officer: _____ Medical Officer: _____

Medical Personnel: _____ _____

_____ _____

_____ _____

SIGNS & SYMPTOMS OF EXPOSURE

Reference Sources: 1) _____

2) _____

3) _____

CHEMICAL #1: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #2: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #3: _____

Signs/Symptoms: _____

_____

_____

CHEMICAL #4: _____

Signs/Symptoms: _____

_____

_____

PATIENT DECONTAMINATION PROTOCOL

In a properly functioning hazardous materials response, victims will be decontaminated in the decontamination corridor by properly suited hazmat team members. EMS personnel may be trained to perform this function. This will include removal of wet or exposed clothing, flushing affected skin and hair with water, and soap or shampoo wash if needed (i.e., for oily or adherent substances). The following basic decontamination protocol should be followed for all contaminated victims.

Patient Decontamination Protocol

1. Determine the need for decontamination by consulting the appropriate protocol and calling your Regional Poison Control Center.
2. For advice on selection of specific protective clothing, you may also contact CHEMTREC at (800) 424-9300 or the AAR Bureau of Explosives at (202) 835-9500. If the proper protective equipment is not available, or prehospital or hospital staff have not been trained to use it, call for assistance from the local, usually fire department, hazmat team.
3. Evaluate ABCs, stabilize spine (if trauma suspected), establish patient airway and breathing, if indicated. Move victim away from contact with hazardous material to a clean area. Rescuers in level "A" (fully encapsulated suit with self-contained breathing apparatus) equipment may not be physically able to do anything more than drag victims on to a back board and then drag them out of the Hot Zone. If not breathing, and if physically possible to quickly accomplish, give oxygen using bag valve mask with reservoir device or manually triggered oxygen powered breathing device.
4. If ambulatory, victims should be directed to leave the hot zone, assist others with evacuation, and decontaminate themselves following the directions below under the direction of the decontamination supervisor.
5. If clothing has been contaminated, strip the victim and double-bag clothing, then flush the entire body with plain water for 2-5 minutes. Clothing contaminated with dust should be removed dry with care taken to minimize any dust becoming airborne. If circumstances, time, and practice allow, a dust mask or respirator should be placed over the victim's nose or mouth. Dust should be brushed off of the face prior to fitting the mask or respirator.
6. Flush exposed eyes and other body surfaces with copious plain water for 2-5 minutes. Eye irrigation should continue for at least 10-15 minutes, preferably with saline.
7. If contaminant is oily or greasy, soap and/or shampoo may be used followed by additional water flushing. Do not use solvents or oils. They will increase absorption of material.
8. Clean under nails with scrub brush or plastic nail cleaner.

IMPORTANT TELEPHONE NUMBERS

EMERGENCY RESPONSE

NJ DEPE HOTLINE . . . (EMERGENCY ACTION LINE)	609-292-7172
CHEMTREC	800-424-9300
ASSOCIATION OF AMERICAN RAILROADS	
BUREAU OF EXPLOSIVES	202-639-2222
EPA REGION II EMERGENCY RESPONSE	908-321-6657
NATIONAL RESPONSE CENTER (U.S.C.G.)	800-424-8802
NEW JERSEY POISON CONTROL CENTER	800-962-1253
NATIONAL POISON CONTROL HOTLINE	800-548-2423

STATE AGENCIES

NEW JERSEY STATE POLICE:

OFFICE OF EMERGENCY MANAGEMENT	609-882-2000 x. 6454
HAZ MAT EMERGENCY RESPONSE PLANNING UNIT	609-882-2000 x. 6462
HAZ MAT TRANSPORTATION	609-882-2000 x. 2586

DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY:

RIGHT-TO-KNOW	609-292-6714
TOXIC CATASTROPHE PREVENTION ACT	609-633-7289
COUNTY ENVIRONMENTAL HEALTH ACT	609-292-6028
DISCHARGE PREVENTION CONTAINMENT & COUNTERMEASURES	609-633-0610
RESPONSIBLE PARTY SITE REMEDIATION	609-633-2168
BUREAU OF HAZARDOUS WASTE ENFORCEMENT	609-984-5855
BUREAU OF EMERGENCY RESPONSE (CENTRAL OFFICE)	609-633-2168

DEPARTMENT OF HEALTH:

RIGHT-TO-KNOW	609-984-2202
PUBLIC EMPLOYEES OSH SERVICE	609-984-1863

DEPARTMENT OF LABOR:

RIGHT-TO-KNOW	609-292-7036

DEPARTMENT OF PERSONNEL:

HUMAN RESOURCE DEVELOPMENT INSTITUTE	609-292-7115

FEDERAL AGENCIES

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OSHA	202-523-6091
OSHA REGION II OFFICE	212-337-2348
NEW JERSEY AREA OSHA OFFICES:	
HASBROUCK HEIGHTS	201-288-1700
DOVER	201-263-1003
AVENEL	908-750-3270
CAMDEN	609-757-5181
NIOSH HOTLINE	800-356-4674
NIOSH HEADQUARTERS	404-639-3771
NIOSH REGION II OFFICE	212-264-4600

ENVIRONMENTAL PROTECTION AGENCY

EPA HOTLINE	202-382-3000
EPA SUPERFUND HOTLINE	800-424-9346
REGION II SARA TITLE III ASSISTANCE	908-906-6900

DEPARTMENT OF TRANSPORTATION

U.S. COAST GUARD THIRD DISTRICT	212-668-7152
ATLANTIC STRIKE TEAM ..... DAYTIME	609-724-0008
NIGHTTIME (ANSWERING MACHINE)	609-562-6730
DOT HOTLINE (CFR TITLE 49)	202-366-4488
DOT/FEMA HAZ MAT TRANSPORTATION HOTLINE	800-752-6367

OTHER FEDERAL AGENCIES

DEPARTMENT OF ENERGY	800-428-2525
TOXIC SUBSTANCES CONTROL ACT HOTLINE	202-554-1404
U.S. ARMY CORPS OF ENGINEERS	202-272-0001
U.S. AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY HOTLINE	404-639-0615

OTHER ASSOCIATIONS

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)	513-661-7881
AMERICAN INDUSTRIAL HYGIENE ASSOCIATION	216-873-2442
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS	201-763-2877
AMERICAN SOCIETY OF SAFETY ENGINEERS	312-692-4121
AMERICAN TRUCKING ASSOCIATION	800-ATA-LINE
CHEMICAL INDUSTRY COUNCIL OF NJ	609-392-4214
CHEMICAL MANUFACTURERS ASSOCIATION (CMA)	202-887-1100
CMA CHEMICAL REFERRAL CENTER (NON-EMERGENCY CHEMICAL INFORMATION)	800-CMA-8200
NATIONAL SAFETY COUNCIL (NSC)	312-527-4800
NATIONAL FIRE PROTECTION ASSOCIATION	617-770-3000
TEXAS TECH UNIVERSITY PESTICIDE HOTLINE	800-858-7378

LEGISLATION ON HAZARDOUS WASTE SITE OPERATIONS

EPA's RCRA (Resources Conservation and Recovery Act of 1976)

—Describes how hazardous waste is to be handled by the generator.

EPA's CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980)

—Provides for the cleanup of sites that were not operated under the guidelines of RCRA and thus are now abandoned or uncontrolled waste sites.

EPA's SARA (Superfund Amendments and Reauthorization Act of 1986)

—Mandates that health and safety regulations for hazardous waste site operations under RCRA and CERCLA be developed by OSHA.

OSHA 29 CFR 1910.120 (Occupational Safety and Health Administration Code of Federal Regulations)

—Spells out specific procedures to be followed during hazardous waste operations.

NJ PEOSHA (NJ Public Employees Occupational Safety and Health Act of 1983)

—Provides OSHA coverage to public employees.

NJ RIGHT-TO-KNOW (NJ Worker and Community Right-to-Know Act of 1983)

—Workers must be told identity of hazardous substances they handle.

EPA'S CERCLA AND SARA

WHAT ARE THEY:

CERCLA deals with the cleanup of hazardous waste sites;

SARA is the reauthorization and further amendments to that act.

PROVISIONS AFFECTING HAZARDOUS WASTE WORKERS:

SARA requires the following training:

- General site workers with potential exposure to hazardous substances—40 hours of off-site instruction and three days of field experience. Workers with unique or special exposures should receive additional training.
- Supervisors must receive eight hours of additional training.
- Anyone not so trained cannot work on the operation.
- Any emergency response worker who might be exposed to hazardous substances should be trained.
- OSHA is to issue specific regulations for site health and safety.
- Any state or local government worker who is not covered by an OSHA state plan will be covered under the OSHA regulations by authority of EPA.

OSHA'S FINAL RULE 29 CFR 1910.120

(EFFECTIVE MARCH 6, 1990)

EMERGENCY RESPONSE AT SITES OTHER THAN HAZARDOUS WASTE CLEAN-UP SITES

Emergency response personnel shall be trained to a competence consistent with the level of response, which may include:

- the recognition of the presence of hazardous materials.
- the role of the first responder.
- understanding the risks associated with hazardous materials.
- basic control and containment operations.
- selection and use of appropriate personal protective equipment (PPE).
- basic decontamination procedures.
- relevant standard operating procedures at the incident site.
- identification and verification of hazardous materials.
- understanding of chemical and toxicological terminology and behavior.
- recognition of symptoms from overexposure.

Competency may be demonstrated by:

- annual refresher training of sufficient content to maintain competency in the appropriate areas; OR
- statement of employee competency in those areas at least annually. The employer will keep a record of the methodology used to demonstrate competency.

Not all employees need to be trained to the highest degree.

- Some First Responders may need only "Awareness" training to recognize that an emergency response situation exists and should be instructed to summon employees who are more fully trained. *First Responders are not to attempt to control situations for which they are not trained.*

First Responder "Awareness" training is sufficient only if:

- arrangements have been made in advance for a fully trained emergency response team to respond in a reasonable period. The intent of the training requirements is to ensure that fully trained personnel are available to respond to emergencies. Each individual emergency response organization is *not* required to have a fully trained HAZMAT team.

HAZMAT teams shall be given the above required emergency response training and additional training, to include:

- the care and use of chemical protective clothing.
- procedures to be followed when working on leaking drums, containers, tanks or bulk transport vehicles.

THE NEW JERSEY "WORKER AND COMMUNITY RIGHT-TO-KNOW ACT" NJSA 34:5A-1

This law guarantees New Jersey citizens access to the exact chemical identity of hazardous substances to which they may be exposed at their workplace or in their communities, and will also provide them with information concerning the short and long term effects of exposure to these hazardous substances.

It requires county health departments to maintain a file of workplace and environmental surveys received from employers and make it available to the public.

It requires employers to complete workplace and environmental surveys and send them to DOH, DEPE, and local fire and police departments so they can plan their response to emergencies at these facilities. Employers must also provide this information to employees and given them training in the potential health risks and in safe procedures for handling the substances under all circumstances.

It requires that all containers holding a hazardous substance be labeled, and that pipelines be labeled at valves and vents designed to discharge the substance.

THE NEW JERSEY PUBLIC EMPLOYEE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1983

This law states that every employer shall provide each of his employees with a place of employment which is free from recognized hazards which may cause serious injury or death to his employees.

It requires that the State of New Jersey encourage employers to reduce health and safety hazards in the workplace, provide for publication and dissemination of information and training materials, and provide for a program for voluntary compliance by employers.

Employees who believe that a violation or imminent danger exists may report it to the employer's appropriate officer and request an inspection. The employee who accompanies the inspector will receive normal wages for time spent during the inspection. No employee may be discriminated against due to filing a complaint of a violation.

The designated inspector has the right of entry during reasonable work hours into any workplace where a violation is suspected. If a violation is determined, the employer shall receive a written order to comply with the standard within a reasonable period of time.

The act is administered and enforced by the New Jersey Department of Labor. Inspections are done by the Department of Labor, Department of Health and the Department of Community Affairs.

ANSWERS TO "TEST YOUR HAZ-MAT IQ"

1. **False.** Clothing and jewelry may contain concentrations of hazardous materials which can be brought into contact with the patient by the falling water.

2. a. **Chlorine.** b. **Methyl bromide or phosgene.**

3. **True.**

4. **False.** All clothes (even those, like underwear, which seem to have escaped contamination) must be laundered before being worn again.

5. **True.** Ideally, the hospital's HVAC systems for areas serving patients exposed to hazardous materials have chemical and particle filters and are isolated from all other hospital HVAC equipment.

6. **False.** Hazardous materials analysis often requires very sophisticated test equipment and highly trained, certified operators and laboratory technicians.

7. **True.**

8. **False.** Leather can be contaminated and should be destroyed. Leather boots absorb hazardous materials and allow exposure to your feet.

9. **False.** The plastic in soft contact lenses absorbs and reacts to certain hazardous materials.

10. **True.**

MEDICAL BASE HISTORY

ORGANIZATION _____

NAME _____ AGE _____

ADDRESS _____ SEX _____

_____ ZIP _____

PHONE # _____ SS# _____

REGULAR CLOTHES—B/P ____ / ____ PULSE _____ RESP. _____

FULL TURNOUT GEAR—B/P____ / ____ PULSE _____ RESP. _____

ALLERGIES _____

MEDICATIONS _____

HISTORY _____

_____

GLASSES _____ CONTACT LENSES _____

DR. _____ PHONE # _____

CONTACT PERSON IN CASE OF EMERGENCY _____

NAME _____

PHONE # _____

SIGNATURE _____ DATE _____

GC-2/90 OEMEMS 91-3

MEDICAL BASE HISTORY

ORGANIZATION _____

NAME _____ AGE _____

ADDRESS _____ SEX _____

_____ ZIP _____

PHONE # _____ SS# _____

REGULAR CLOTHES—B/P ____ / ____ PULSE _____ RESP. _____

FULL TURNOUT GEAR—B/P ____ / ____ PULSE _____ RESP. _____

ALLERGIES _____

MEDICATIONS _____

HISTORY _____

_____

GLASSES _____ CONTACT LENSES _____

DR. _____ PHONE # _____

CONTACT PERSON IN CASE OF EMERGENCY _____

NAME _____

PHONE # _____

_____

SIGNATURE _____ DATE _____

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